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EYE, EAR, NOSE AND THROAT NURSING

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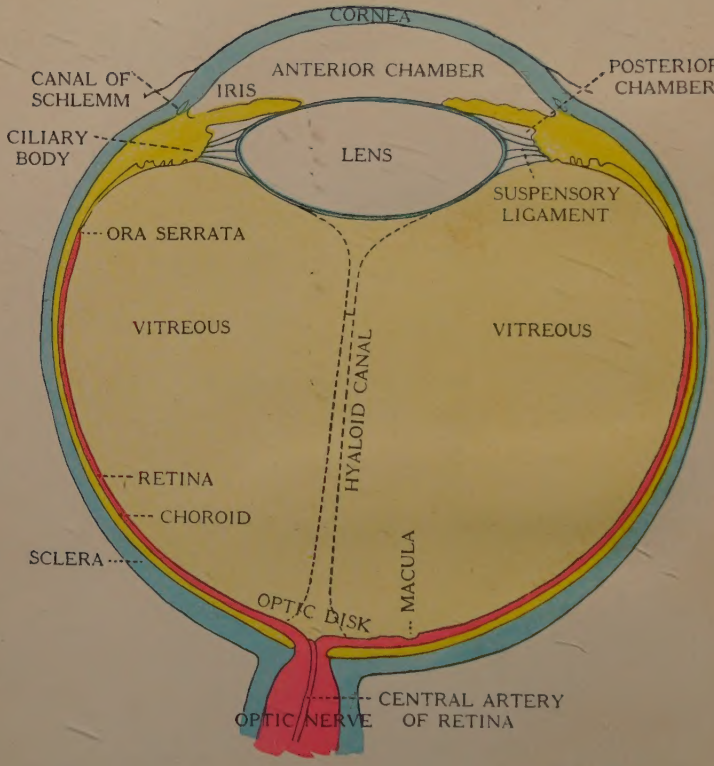

FIG. 1.—Horizontal Section of the Eyeball (from Dr. May's Manual of the Diseases of the Eye)

A Textbook of Eye, Ear, Nose and Throat Nursing

BY

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To Miss Annabella McCrae

WHO AS A TEACHER HAS
INSPIRED, AND AS A FRIEND HAS
ENCOURAGED ME IN THIS WORK.

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PREFACE

In preparing this short *Textbook of Eye, Ear, Nose and Throat Nursing,* I have endeavored to prepare a book from the nurse's point of view, which will be of assistance to nurse instructors in the field, to students, to public health and school nurses, and which will serve also as an aid to those who may desire to outline courses of instruction in Eye and Ear work.

The work outlined in the book should be supplemented by additional lectures in greater detail by the doctors, and by practical demonstration and bed-side clinics.

It is understood of course that all procedures in general practical nursing have been learned, as should be the case, before the study of such highly specialized work is undertaken.

The preliminary chapters on anatomy and physiology should enable the student to understand more clearly and intelligently the diseases common to each structure.

Although the therapeutic measures and practical procedures described are in common use at the Massachusetts Eye and Ear Infirmary, it is understood that there are other methods worthy of merit.

For encouragement, assistance, helpful suggestions, and cooperation, I wish to express my appreciation to Dr. W. Holbrook Lowell, who read the proof of the section on the

Eye; to Dr. Benjamin Sachs for his suggestions and criticisms; to Dr. Harry P. Cahill for his assistance in the section on the Nose and Throat; to Dr. Leon White for his assistance in the section on the Ear; to other members of the staff, and to the head nurses and house officers of the Massachusetts Eye and Ear Infirmary. I wish also to express my appreciation to Miss Amy G. Smith for her contribution in the chapter on Social Service. To Edward Braxton Kirk, I am indebted for the drawings which have been used as illustrations.

EYE, EAR, NOSE AND THROAT NURSING

EYE, EAR, NOSE AND THROAT NURSING

CHAPTER I

ANATOMY AND PHYSIOLOGY OF THE EYE

The nurse who enters into the special field of ophthalmic nursing finds a subject that demands not only a specialized technique but a background of general nursing knowledge.

If she wishes to acquire an intelligent insight and an understanding of the problems of ophthalmic nursing care, she must familiarize herself—if in outline only—with the elements of ophthalmology and the problems of the ophthalmologist. This means adding to her already general knowledge of anatomy and physiology a more detailed acquaintance with the anatomy and physiology of the eye and its related structures, including such as the orbit, its contents, the lids, and lacrimal apparatus.

Neurology has an important place, for the eye as the most highly evolved special sense organ is very intimately related to the brain. Since the eye is many times affected by systemic conditions or by diseases affecting a far removed part of the body, medicine demands some attention. Anatomy, physiology, neurology, pathology and medicine then, must all be recognized as component parts of the sub-

ject, a knowledge of which is necessary as a background for nursing.

With such a complex study before one, the multitude of details often demands so much attention that the general significance of the subject is obscured or even lost. The student is urged, therefore, to keep before her the general picture even when in pursuit of the details. In this way, the whole subject of ophthalmic nursing will gain unity, and many of the seemingly unrelated facts, more significance.

It is hoped that the student will gain an understanding of the importance of the eye in health, its care in disease, and some little of the wonders of its mechanism.

Of necessity, the anatomy and physiology have been treated in a rather summary manner. It is recommended that the student supplement the material of the text by the reading and study of standard works on the subject such as are given under *References* at the end of each section.

Orbit

The eye, which is one of the most highly specialized organs in the body, lies within a funnel-shaped bony cavity, which terminates at the end in the optic foramen. Through this opening enter the blood vessels, optic nerve, and central artery. Seven bones help to form the walls of the orbit, namely: the frontal, superior maxillary, palatine, lacrimal, malar, ethmoid, and sphenoid.

The eye rests upon a cushion of fascia, which acts as a protection to the cornea and surrounds the posterior two-thirds of the eyeball, and orbital contents. In addition, a membrane surrounds the eyeball extending from the cornea to the posterior part of the orbit. This smooth membrane,

which is lined with epithelium, is called Tenon's capsule, and permits free movement of the eyeball in all directions.

Function—The function of the orbit is mainly that of supporting and protecting the eyeball. It serves also as a source of attachment to the six extrinsic muscles.

Lids

Two rows of lashes, or cilia, spring from the margin of the lids. Deeply embedded in each of these follicles is a Zeiss Gland, sebaceous glands which lubricate.

Between the skin of each lid and the conjunctiva is the tarsus, a very thick plate of fibrocartilaginous tissue about one inch in length, which gives firmness and support to the lid.

Embedded within the tarsal plate, or cartilage as it is sometimes called, are the sebaceous or Meibomian glands, about 50 in number, 30 in the upper lid and 20 in the lower.

The opening between the lids is known as the palpebral fissure. At the extreme ends of this fissure the lids unite forming the internal and external canthus.

At the internal canthus is seen an irregular reddish eminence called the caruncle. It contains numerous sebaceous and sweat glands, and is covered with minute, light-colored hairs.

Function of Lids

The function of the lids is to shade the eye from light and to protect it from injury and exposure. Also the secretions from the tear and sebaceous glands are distributed over the eyeball and palpebral conjunctiva by the movement of the lids, leaving a moist clean surface.

Lacrimal Apparatus

The lacrimal apparatus can be divided into two divisions—

1. *Secretory*—There are two lacrimal glands which secrete the tears; the superior gland is situated in a fossa in the orbital plate of the frontal bone, the inferior or accessory gland in the upper lid at the upper outer angle. A fibrous septum separates them.

2. *Conducting*—Eight or twelve ducts which carry the tears from the glands empty into the upper lateral half of the superior conjunctival fornix.

The tears pass by way of the superior conjunctival sac into the lacrimal puncta, two minute openings at the internal canthus, one on each lid. From each punctum a canaliculus —a small canal—carries the tears into the lacrimal sac. This sac is embedded within a groove, formed by the lacrimal bone and frontal process of the maxilla. From the lacrimal sac the tears pass through the naso-lacrimal duct which empties into the nose, under the inferior turbinate bone.

Function—The tears assist in keeping the eyeball moist, and aid in keeping the cornea free of dust particles and other foreign bodies. Moisture is also necessary to maintain the transparency of the cornea.

MUSCLES

Of the Lids

The chief muscles of the lid are the levator palpebral superioris and the orbicularis oculi. The levator, which raises the lid, originates at the foramen, and is inserted into the upper border of the tarsus. The levator receives innervation from the third cranial or motor oculi nerve.

The orbicularis or sphincter muscle surrounding the pal-

pebral fissure lies directly beneath the skin. The facial or seventh cranial nerve innervates the orbicularis.

Function—Its function is to close the lids.

There is a third group called Müllers Muscles, or musculus tarsales—superior and inferior. These muscular fibers which intermingle with the levator and orbicularis muscles, are inserted into the upper margin of the tarsus of the upper and lower lids.

Function—The function of Müllers Muscles is chiefly to assist the levator in elevating the lid.

Blood Supply—The blood supply of the lids is derived chiefly from the ophthalmic artery, the supply to the upper lid coming from two arterial sources, the tarsus superior and tarsus inferior. The veins empty into the veins of the forehead and into branches supplying the ophthalmic vein.

Lymph—The lymph vessels, which are very abundant, empty into the preauricular, parotid, lymphatic, and submaxillary glands.

OCULAR MUSCLES

Groups—The ocular muscles are divided into two groups: extrinsic and intrinsic.

The extrinsic group includes four recti and two oblique muscles all of which originate at the apex of the orbit and are attached to the surface of the globe.

The action of these muscles determines the position of the eyeball, relative to the orbit,—that is, they move the eye upward, downward, inward, outward or in a rotary motion.

Recti—The four recti muscles, (internal, superior and inferior), take their origin from the apex of the orbit, extend

forward, around the globe in divergent directions, and are inserted into the sclera near the limbus.

Action—The chief action of the recti muscles is to direct the line of sight upward, downward, inward or outward.

Nerve Supply—The third cranial nerve or motor oculi, supplies all recti muscles except the external, which is innervated by the abducen or sixth cranial nerve.

1. *Superior oblique*—This muscle also arises from the optic foramen, passes forward along the upper inner wall of the orbit, then after passing through the loop of the trochlea, which acts as a small pulley, it changes direction and attaches itself to the globe.

2. *Inferior oblique*—The inferior oblique arises from the lower margin of the orbit, near its inner extremity, runs upward and outward, beneath the inferior rectus and is inserted at about the horizontal meridian of the globe.

Action—The courses of the oblique muscles are more complicated than those of the recti group. Their chief function is that of controlling the rotary movements of the eyeball mainly by antagonistic action to the rotary motion caused by the recti muscles.

Nerve Supply—The superior oblique is supplied by the fourth cranial nerve or trochlea, and the inferior oblique by the third.

CONJUNCTIVA

Anatomy—The conjunctiva is a thin, delicate, transparent membrane, beginning at the margin of the lids and covering the under surfaces of both lids, and continuing over the globe and cornea. It is divided into three sections:

1. Palpebral conjunctiva is that portion lining the lids and is closely adherent to the tarsi.

2. Conjunctiva of the fornix forms the loose folds which constitute the conjunctival sacs.

3. The third, or ocular, conjunctiva reflects over the sclera and continues over the cornea in the form of a very thin epithelium. The ducts of the lacrimal glands open into the upper fornix, in the upper-outer part of the sac.

Blood Supply—The blood supply is derived chiefly from the branches of the ophthalmic artery, the long and short ciliary branches.

Lymph Supply—The conjunctiva is richly supplied with lymphatics, which anastamose freely beneath the epithelial layer.

Nerve Branches—Branches of the fifth cranial nerve furnish the chief supply to the conjunctiva.

Function—The conjunctiva presents a smooth surface when lubricated by the tears, allowing the eyeball to move without friction between it and the lids.

TUNICS

The tunics or coats of the eyeball are usually considered as three in number. From without inwards, they are:

1. The protective or outer tunic which includes the cornea and covers the anterior 1/6 of the globe. The posterior portion of the protective tunic is the sclera which covers the remaining 5/6 of the globe.

2. The vascular tunic including the iris, ciliary body, and choroid, supplies nourishment to the eye.

3. Nervous or visual tunic—The retina is the only structure which makes up the nervous or visual tunic. Upon this

delicate membrane the light images are formed by the lens and refractive media of the globe.

Refractive media—The refractive media include the cornea, aqueous humor, lens, and vitreous humor. Through these structures the light rays pass before being brought to a focus on the retina. These media form the image on the retina.

THE CORNEA

The cornea, which is one of the most transparent and sensitive tissues of the body, forms part of the outer protective tunic. Normally, the cornea is devoid of blood vessels. The junction of cornea and sclera is known as the limbus or the corneo-scleral junction. The cornea consists of five layers. From without inwards these are:

1. Stratified epithelial layer. This is a very thin membrane.

2. Bowman's Membrane—together with the epithelium—is continuous with the conjunctiva.

3. Beneath Bowman's Membrane is the corneal stroma or corneal tissue proper, arranged in lamellae, or scale-like portions bound together by a cement substance. Penetrating this cement substance are small communicating spaces containing the corneal cells, and also, small communicating spaces in it form the lymph system which permits the passage of nutrient fluids from the periphery to all parts of the cornea. These lymph spaces also give passage to nerve filaments.

4. Posterior to this is a thin elastic membrane called Descemet's Membrane. At the corneal margin, it breaks up into a meshwork of fibres forming the spaces of Fontana.

These fibres continue into the iris substance and form the ligamentum pectinatum.

5. The posterior layer of the cornea is a single layer of flattened hexagonal cells, the endothelium.

Nourishment

The nourishment of the cornea is obtained from a net work of vessels of the corneo-scleral margin by the process of osmosis. The movement of the lids tends to circulate the fluid in the corneal substance.

Nerve Supply

The cornea is more richly supplied with nerves than any other tissue in the body, deriving its supply partly from the ciliary nerves and partly from the bulbar conjunctiva. This is necessary in order to maintain its transparency. The slightest irritation initiates the wink reflex tending to remove the irritation.

Function—The function of the cornea serves both for protection and refraction, giving a transparent area through which the light rays pass to the retina.

SCLERA

The sclera, which forms 5/6 of the protective tunic of the eye, is a tough, inelastic, opaque membrane. Together with the cornea and conjunctiva, it forms the complete outer tunic.

It is composed of bundles of connective tissue, arranged irregularly, between which are found a few flat cells. The thickness of the sclera varies at different points. Usually it is about 1 m.m. thick posteriorly, but diminishes in thickness anteriorly except where the recti and oblique muscles

are inserted. Normally the outer surface is smooth and bluish-white in color, but on the posterior surface it has a dark brown color and is marked with grooves, where the ciliary vessels and nerves are embedded.

At the limbus, or sclero-corneal junction, the cornea and sclera blend, without any definite line of demarcation.

Posteriorly, it is pierced by the optic nerve, at the lamina cribrosa. The fibres at this point form a meshwork through which pass the nerve filaments. One opening, larger than the others, which occupies the center of the lamina, transmits the central artery and vein of the retina. Other apertures, about four or five in number, which transmit the veins (venae vorticosae), are found between the entrance of the optic nerve and the sclero-corneal junction.

The canal of Schlemm, or the sinus venosus sclerae, is found in the inner part of the sclera, very close to the sclero-corneal margin, and is separated from the anterior chamber by the ligamentum pectinatum and the Spaces of Fontana.

Blood Supply—A capillary network with wide meshes passes through the entire membrane, but in general, its blood supply is poor—coming chiefly from the ciliary arteries.

Lymph—There is a lymphatic system in the sclera which resembles that of the cornea.

Nerve—The chief nerve supply to the sclera is derived from the ciliary nerves.

Function—In addition to protecting the inner coats and helping to maintain the shape of the eye, the sclera furnishes a firm tissue into which the muscles of the eyeball are inserted.

ANTERIOR AND POSTERIOR CHAMBERS

The anterior or aqueous chamber is bounded posteriorly by the lens, the iris, and the ciliary body, and in front, by the cornea. The anterior portion of the ciliary body and the ligamentum pectinatum form the lateral boundaries beneath which is found Schlemm canal.

The depth of the *anterior chamber* varies; it is comparatively deep in the young, in myopic eyes, and when the eye is focused for distant objects.

The iris divides the aqueous chamber from the posterior chamber; the former is in front of the iris and the latter is between the iris, the lens, and its suspensory ligaments.

Through the pupillary opening the anterior chamber communicates with the posterior chamber.

The angle of the anterior chamber (or iris angle) is formed where the sclero-corneal margin, iris, and ligamentum pectinatum meet; a very important region. *The posterior chamber* is bounded in front by the iris and laterally by the ciliary body, while the inner or posterior wall is formed by the lens and its ligaments.

The aqueous humor, which is elaborated by the ciliary body, fills both the anterior and posterior chambers.

THE IRIS

The iris is a circular, contractile, curtain (or ruffle) suspended from the corneo-scleral junction (back of the limbus) and directly in front of the lens. Its free edge floats in the aqueous humor. The iris belongs to the second or vascular coat of the eye. It contains the color pigment of the eye, and is perforated by the pupil.

In structure, the iris consists of extremely delicate and vascular tissue, abundantly supplied with nerves and blood vessels.

It contains two sets of muscle fibres, which come under the heading of intrinsic muscles, namely: (1) The sphincter pupillae or purse string muscle: a narrow band, encircling the pupil which, when it contracts, pulls together the inner border of the iris, thereby reducing the pupillary opening. (2) The dilator pupillae, consisting of radiating fibres, which contract to fold the iris on itself, pulling the folds into the angle of the anterior chamber.

Nerve Supply—The iris is plentifully supplied with nerves from branches of the oculo-motor and trifacial nerves.

Blood Supply—The blood supply is derived from two sets of anastomosing vessels derived chiefly from the ophthalmic artery.

Function—The function of the iris is to regulate the amount of light entering the eye (also aiding to maintain a sharp image on the retina by decreasing astigmatism and abberation when the lens is focussed for near objects).

Spaces of Fontana

These are small spaces in the intervals between the fibres of the ligamentum pectinatum iridis situated in the angle of the anterior chamber. They communicate (not directly, but through endothelial membrane) with a circular canal called the canal of Schlemm situated at the limbus. The function of these spaces and the canal of Schlemm is that of drainage. This outlet allows a slow circulation of aqueous to take place. As the aqueous is secreted by the ciliary processes, it passes from the posterior chamber through the

pupillary opening, thence into the anterior chamber, then, at the angle, it passes through the spaces of Fontana to Schlemm's canal and finally into the anterior ciliary veins.

CILIARY BODY

The ciliary body consists of the ciliary processes and the ciliary muscle. It is composed of a connective tissue frame work containing muscle fibres, blood vessels, and nerves, and is attached to the sclera by the ligamentum pectinatum, about two millimeters back of the margin of the cornea or limbus. It is continuous with the choroid in its deeper layers, and in its inner layers, with the iris.

Function—Since the ciliary muscle, a muscle of accommodation, constitutes a part of the ciliary body, its chief function is that of accommodation.

Ciliary Processes—The processes consist of about 70 folds or thickenings, arranged meridianally so as to form a circular band on the inner surface of the ciliary body. They are of the same structure as the choroid, only more vascular.

Function—The function of the ciliary processes is to secrete the aqueous humor—the nutrient fluid which sustains the vitality of the lens, and to a certain extent that of the vitreous humor and the cornea.

Blood Supply—The blood supply of the ciliary body is derived from the iris and from the anterior ciliary arteries.

Nerve Supply—The ciliary body derives its chief nerve supply from the ophthalmic division of the fifth, and the long posterior ciliary nerves.

THE CHOROID

The choroid is a thin, very vascular membrane composed of a dense network of blood vessels and veins, united by

thin connective tissue in which is found pigment cells. The choroid is continuous with the ciliary body in its deeper layers. It is firmly adherent to the sclera and is pierced posteriorly by the optic nerve.

Blood Supply—The blood supply of the choroid is derived chiefly from the posterior ciliary arteries.

Nerve Supply—The choroid is devoid of sensory nerves.

Function—The choroid serves chiefly as a source of nutriment for the lens, vitreous, and retina.

UVEAL TRACT

The iris, ciliary body, and choroid, which have been described above, together compose the uveal tract (so called because it resembles the inner part of a ripe grape skin).

REFRACTIVE MEDIA

Cornea—Aqueous Humor—Lens—Vitreous Humor

Aqueous Humor

The aqueous humor is a clear transparent fluid (in normal health) filling the anterior and posterior chambers. It is similar in composition to normal salt solution, but contains also a small amount of nutrient substance. It is secreted by the blood vessels of the ciliary body.

Function—The aqueous humor assists in maintaining the shape of the eye, and by supporting equally from all directions, permits free movement of the iris.

Vitreous Humor

The vitreous humor is a transparent mass filling the globe back of the lens. It is composed of a meshwork of delicate

fibres filled with fluid similar to the aqueous humor. It derives its nutrition from the secretion thrown out from the adjacent choroid and ciliary processes.

Function—It maintains the shape of the eye and holds the retina in close contact with the choroid and aids in supporting the lens. The pressure from the vitreous holds the retina firmly against the choroid. This is very necessary since the retina derives its nourishment in the main, from the rich capillary plexus of choroid.

Lens

The crystalline lens is a transparent biconvex body suspended immediately behind the pupillary opening of the iris and in front of the vitreous body. It is composed of delicate transparent fibres, held together by a transparent cement substance, and is encircled by the ciliary processes. Water, albuminous material, traces of cholesterin, and a small amount of fat enter into its composition. The lens is held in position just back of the pupil by suspensory ligaments, or Zonula of Zinn. It is devoid of any blood or nerve supply, and it derives its nourishment from the aqueous system.

Function—The function of the lens is to change through the process of accommodation the refractive power of the eye so as to permit the rays from either near or far objects to be focussed on the retina. As the rays pass through the different media, 2/3 of the bending is accomplished by the cornea and aqueous and 1/3 by the lens.

Accommodation, although usually under voluntary control, is associated with convergence. Also the lens loses its ability to change its shape with age. This results in presbyopia.

RETINA

Visual or Nervous Tunic

The perceptive coat of the eye is the retina, a delicate transparent membrane which lies in intimate contact with the inner surface of the choroid, being held in place by the pressure of the vitreous.

The optic nerve, as it penetrates the globe, spreads out, or expands, over the posterior 2/3 of the inner surface of the choroid as the innermost tunic of the eye, and terminates at the ora serrata. Ten layers of nerve fibres, cells, rods and cones (the light sensitive elements) comprise this very delicate membrane.

Examination of the innermost coat of the eye is made with the ophthalmoscope. This instrument reflects the light into the eye, and a clear picture of the disc, blood vessels and macula of the fundus may be seen. The intensity of the red-orange color of the fundus depends largely upon the complexion of the individual, lighter in blonds, and darker in brunettes.

The *disc,* or blind spot, which represents the entrance of the optic nerve, is somewhat lighter in color than other parts of the fundus, the outer margin of which is distinctly demarcated from surrounding portions. This area has neither rods nor cones and is therefore insensitive to light.

A little to the temporal side of the optic disc is the macula lutea, sometimes called the yellow spot of most acute vision. In the center of the macula is a small depression, the fovea centralis, and it is in this depression that the light rays come to a focus. Over the area of the macula, the light perceptive elements, especially the cones, are packed very closely

together, giving an increased sensitivity to variations of the image. Over the area of the fovea (the area of most acute vision) there are only cones, and these are packed even closer together.

Blood Supply—The blood supply of the deeper layers of the retina is derived from the central retinal artery. Some of the choroidal vessels supply the outer layers. The retinal veins, confluent to the retinal arteries, carry off the venous blood.

Function—Normally, images of exterior objects are brought to focus on the retina, and the light pattern, by an extremely intricate process, is converted into nervous stimuli, which are carried to the brain for interpretation.

The fovea (a depression in the macula) is the area having only cones. Here the discriminative power of the eye is greatest, that is, the image formed by the lens can be appreciated in more detail than on any other part of the retina. Normally the eyes are turned so that the image of the object to be examined falls on this area. The discriminating power of the retina decreases with the distance from the fovea.

The rods and cones are thought to be the receptive elements of the retina. The light pattern of the image stimulates them either directly or through the aid of an intermediate substance, visual purple, a fluid which is present between the rods and cones. The cones are believed to function for color vision, while the rods serve the more primitive function of achromatic vision.

OPTIC NERVE

The optic nerve which consists of many bundles of nerve fibres closely bound together, pierces the sclera and choroid

at the posterior part of the globe a little to the nasal side of the posterior pole.

The nerve is divided into three portions: (1) The intra-ocular portion, consisting of the head of the nerve; (2) An orbital portion, extending from the eyeball to the optic foramen; (3) Intracranial portion, connecting the optic foramen with the chiasm, where the fibres partially decussate and continue as the optic tracts to the primary visual centers of the brain.

The outer layers of the choroid become continuous with the sheaths of the nerves, while the inner layers of the retina, with parts of the choroid, combine and traverse the foramen. This lattice-work of fibres which is called the lamina cribrosa, strengthens the eyeball which at this point is weakened by the emergence of the nerve through the tunics of the globe.

In passing through the cribrosa the nerve narrows, the fibres lose their medullary sheaths, become transparent, and spread out over the posterior two-thirds of the interior surface of the chroid, to form the retina.

It is interesting to know that various estimates place the number of fibres from 500,000 to 1,500,000. This gives the eye as many fibres as the rest of the body has. Also, in the eye, we find nervous tissue reaching its most highly developed and differentiated form, excepting only the brain.

CHAPTER II

DRUGS AND SOLUTIONS

To facilitate the use and application of drugs and solutions used in ophthalmology, a classification is made by which the drugs are grouped according to the action on the pupil. For example, the chief factor in the treatment of certain diseases, such as iritis and glaucoma, is a dilated and contracted pupil respectively. In other conditions, merely a local effect of the drug on the tissues is desired. Such is the action of the antiseptic and astringent groups.

Another important group of drugs includes those which are used to allay pain.

In addition to knowing the technique necessary for eye treatments, one should be familiar with the action of the drugs commonly used. If the proper action of a drug is known, the possibility of recognizing undesirable reactions is more likely.

There are cases of toxemia, resulting from an overdose or from the excessive use of potent drugs. Since these reactions develop very quickly, early manifestations of poisoning should be reported at once.

Only drugs and solutions commonly used in the treatment of eye diseases will be discussed briefly.

I. ANTISEPTICS

Antiseptics are drugs which inhibit the growth of bacteria by rendering the fluid in which they live unfit for their growth.

Boric Acid solution, although only slightly antiseptic in its action, is used in 2 to 4% solutions, chiefly as an irrigating or cleansing agent.

Boric Acid as an ointment will prevent the lids and lashes from adhering if used twice or three times daily; 10% is most commonly used.

Bichloride Ointment (known as White's Ointment) is made up of mercury grs. 1/8, sodium chloride grs. 5/6, and vaseline 1 oz. White's Ointment is usually used for post-operative treatments at which time it is dropped into the culdesac. It is believed that some patients have an hypersusceptibility to bichloride, which may result in a local irritation following its use, even in weak strengths. Under these conditions the use of bichloride would be contraindicated.

Nosophen, made from phenolphthalein and iodine in the form of an ointment, is used chiefly in the treatment of corneal ulcers. Because of its tendency to harden on the lids, it may in some cases cause the patient slight discomfort.

II. GERMICIDES

Germicides are drugs which destroy bacteria.

Optochin, Ethylcupreine Hydrochloride, is a synthetic chemical built up from an alkaloid obtained from the Cuprea bark. Optochin, which is also an irritant, acts specifically on

pneumococcus infections of the eye. Because of its irritating effect, it should be used in 1/4 to 2% solutions; in stronger solutions, its highly irritating properties may be injurious.

Mercurochrome is a compound of mercury and fluorescein. In ophthalmology it is used in treating inflammatory diseases of the conjunctiva and preceding operation, in preparing the eye.

Opinions vary concerning its efficacy in ophthalmology—whether or not it is actually of value as a germicide is a question, especially in the treatment of conjunctival diseases.

For the skin preparation preceding operation, some authorities believe it to be greatly superior to iodine, mainly because mercurochrome in contrast to iodine can be used effectively on wet surfaces; a 1% solution is usually used. Also on the conjunctiva or the skin, mercurochrome may be used with equal effect and, of course, danger of burning the skin is eliminated.

When using mercurochrome, do not use it in conjunction with other drugs because of a precipitate which forms under those conditions.

Care should be used in the use of mercurochrome, otherwise the eyelids and surrounding area will become badly stained.

Argyrol, a compound of silver and protein (known as mild silver proteins) is not used to any great extent in ophthalmology, except as a coagulent in the treatment of gonorrhoeal conjunctivitis. Percentages ranging from 10 to 25 or even 50% may be used.

In the treatment of diseases which run a long course,

such as chronic tear sac for example, argyrol should never be used because of the danger of argyrosis. Argyrosis results from the absorption of the silver salts by the tissues of the conjunctiva, which becomes markedly and permanently discolored—a yellowish-brown color.

Protargol, a compound of protein and silver (known as strong silver proteins), is used more extensively than argyrol. It is more irritating, and clinical tests prove it to be far more efficient than silver nitrate. (Butler). In 4% solutions it is often used as the prophylactic treatment of the new born. In preparing the eye for operation, protargol 4% is frequently dropped into the culdesac.

III. ASTRINGENTS

Drugs which contract the tissues are called astringents.

Organic silver salts are invaluable in ophthalmology, being used as antiseptics, germicides or astringents, depending upon the strength of the solution. In strong solutions they act as caustics.

In the treatment of gonorrhoeal infections of the conjunctiva, they are extremely important. The prophylactic uses of silver salts will be discussed in another chapter. (Chapter VI).

Zinc Sulphate is used chiefly for various forms of conjunctivitis. It is slightly antiseptic and astringent in its action.

Adrenalin Chloride—For surgical purposes in ophthalmology, adrenalin chloride is used for its hemostatic action, as in general surgery. A few drops of adrenalin 1-1000 are combined with novocaine or cocaine for local injection.

Adrenalin is also used to dilate the pupil for breaking up

posterior synechiae in iritis by injecting 3 to 5 minims conjunctivally.

Astringent Ointments

Ointments are indicated when the lacrimation is excessive. The oil base prevents the tears from washing the ointment out of the culdesac.

Yellow Oxide of Mercury is used usually in 4% strengths in the treatment of hordeola, blepharitis, ciliaris and phlyctenular keratitis.

Scarlet Red is an anilin dye used mostly in 4-8% solutions to stimulate the growth of epithelium.

IV. MYOTICS

Myotics are drugs which contract the pupil. Eserine and pilocarpine are the most important members of this group. Myotics act by stimulating the nerve ends of the sphincter muscles of the iris, which contract the pupil. The chief uses of myotic drugs are:

1. In glaucoma, to reduce the tension or increased intraocular pressure.

2. In cases of ulcers at the periphery of the cornea—to prevent prolapse of the iris (alternating with atropine, in event of perforation).

3. Sometimes to counteract the effects of a mydriatic.

Normally, the aqueous humor, secreted by the ciliary processes, flows into the posterior chamber, then through the pupillary opening into the anterior chamber. The outlet of the aqueous is through the Spaces of Fontana, and Schlemm's Canal, and finally out into the general lymphatic circulation. Any interference with this outlet causes the

aqueous, which is constantly secreted, to collect within the eye with a resulting increase in tension.

Myosis draws away the folds of the iris from the iris angle, leaving the angle unobstructed. Since the escape of the aqueous is through Schlemm's Canal, which is located in the region of the angle, freeing this space promotes better drainage with a subsequent lowering of the tension.

Myotics merely act as auxiliaries in the treatment of glaucoma, forming the non-operative treatment. In the prodromal stage of a glaucomatous attack, myotics will lessen its extent and severity.

Pilocarpine Nitrate is the active principle of a drug obtained from a Brazilian shrub called pilocarpus or jaborandi; a solution of 1-2% is usually used. In the treatment of glaucoma, pilocarpine is effectively used to contract the pupil. Its effect upon the pupil lasts approximately from 2 to 3 hours.

Eserine Sulphate, obtained from the physostigmine or the Calabar bean, is much stronger and irritating than is pilocarpine. Because of these irritating and painful effects, eserine is used less frequently than pilocarpine.

The usual strength of eserine used is 1/2 of 1%, and the lasting effect about the same as that of pilocarpine.

V. MYDRIATICS

Mydriatics are drugs which dilate the pupil by paralyzing the third nerve which enervates the sphincter muscle or by action directly on nerves of radial fibres, and the process is known as mydriasis.

In this group, atropin is used most extensively, while

homatropin euphthalmine and cocaine, in order of their importance, follow in frequency of use.

In addition to the mydriatic action, atropin and homatropin have also a cycloplegic action which will be discussed under the heading of Cycloplegics.

Cocaine is classified primarily as an anesthetic, under which heading it is discussed, although it has mydriatic properties and dilates the pupil.

Atropin Sulphate, an alkaloid obtained from the Belladonna plant is used in 1 or 2% solutions. In ophthalmology, atropin is extremely useful, and is used to dilate the pupil and to paralyze accommodation. For patients under 10 years of age a drug as strong as atropin is necessary to paralyze the ciliary body. As a cycloplegic, atropin is discussed under Section VI.

One should always remember that atropin is an extremely powerful drug; if it is used over a long period, and proper precautions have not been observed (holding the puncta at each treatment), toxemia may result. In connection with the use of atropin, it is interesting to know that one drop of a 1% solution contains 1/100 gr. of atropin. This solution, when instilled into the normal eye, will cause the pupil to dilate. The lasting effect of atropin on the pupil varies, but it is usually from 7 to 10 days, or more.

The signs and symptoms of atropin poisoning are more or less classical, one of the earliest of which is excessive thirst. This is soon followed by dryness of the mouth and throat; in later stages the patient may have difficulty in swallowing. The skin becomes dry and flushed and has a characteristic bluish-red tinge, while the extremities may become cyanotic. There is usually an elevation in the

temperature and an increase in the pulse rate; the pupils are extremely dilated.

Atropin poisoning which takes place by absorption in the stomach, may be prevented by applying pressure over the lacrimal puncta following the instillation of the drug. This process allows most of the atropin to remain in the culdesac and prevents it from running down into the nose. The puncta should be held at least a half minute, after solutions of ordinary strength have been used, and longer following the use of stronger solutions. Intelligent patients may be taught to carry out this procedure themselves, under supervision of the nurse.

Children and patients who have idiosyncrasies to atropin are very susceptible to the drug—hence one of the chief duties of the nurse is to watch for any indication of atropin poisoning. The use of atropin in suspected cases of glaucoma is obviously contraindicated, and of course, once the disease is established is absolutely forbidden.

Treatment for Atropin Poisoning

The treatment for atropin poisoning should begin with immediate discontinuation of the drug and by reporting the case to the doctor. The treatment depends somewhat upon the severity of the reaction. If the patient shows any systemic reaction, the place for him is in bed with plenty of blankets and hot water bottles. Many reactions are ushered in with a chill.

In severe cases it may be necessary to treat the patient for collapse, giving stimulants, such as caffeine or strychnine.

Hyoscine or Scopolamine Hydrobromide

Frequently following the use of atropin the patient may show a systemic reaction, or a local dermatitis develops, because of the irritating effect of the drug on the skin. In such cases, hyoscine 1/10 to 1/3 of 1% may be substituted. As a cycloplegic, a solution of 1/5% gives a satisfactory relaxation of the ciliary muscle. The effect usually lasts about 4 days (Marlow). For dendritic keratitis, hyoscine is often used.

Homatropin is a synthetic alkaloid made from tropine. It is mydriatic and cycloplegic in its action, dilating the pupil and paralyzing accommodation. For patients of ages from 10 to 45 years, homatropin is frequently used preceding refraction. In such cases one drop is instilled in each eye every 10 minutes for 1½ hours, or until the pupil is fully dilated. The effect of homatropin is not as lasting as that of atropin and it acts more quickly.

Euphthalmine is an alkaloid, used in 2% solutions usually to dilate the pupil, preparatory to an ophthalmoscopic examination. It does not paralyze accommodation, and the effect wears off quickly. Instruct the patient to close the eyes as soon as the drug is administered. The number of drops necessary to dilate the pupil varies, depending upon the individual and upon the condition of the eye. In cases of suspected glaucoma, euphthalmine is preferred to atropin.

VI. CYCLOPLEGICS

A cycloplegic is a drug which not only dilates the pupil but paralyzes accommodation, which condition is known as cycloplegia.

Atropin, homatropin and euphthalmine are also classified under this heading.

The chief uses of cycloplegics are to paralyze accommodation preceding refraction and to put the ciliary muscle at rest when treating diseases of the ciliary body. Usually one drop of atropin solution 1%, dropped in each eye 3 times daily for three days will produce a sufficient relaxation of the ciliary muscle.

Since the eye is able to overcome a great amount of refractive error by the action of the ciliary muscle, paralysis of this muscle is necessary to determine the full extent of the refractive error.

VII. ANESTHETICS

Local anesthesia is employed to a great extent in ophthalmology. The chief local anesthetics in use are cocaine and holocaine. When deep anesthesia is necessary, novocaine or procaine is usually used. Much of the operating upon the eye (operations such as iridectomies, trephines, pterygia and cataract extractions) is successfully done under local anesthesia. General anesthesia is necessary, however, for children and for those who are apt to become hysterical and uncooperative.

Other uses of local anesthesia are: preceding the removal of ocular foreign bodies, in measuring the intraocular pressure, and finally before the use of a highly irritating drug. An instrument called the tonometer placed directly on the cornea is used to measure the tension.

Cocaine Hydrochloride, when instilled into the eye, paralyzes the nerve endings in the conjunctiva producing a local anesthesia. The usual strength of the solution is 4%; as

a rule one drop every 5 minutes for three doses is sufficient.

Cocaine dilates the pupil rapidly by stimulating the sympathetic nerves, but accommodation is unaffected. Cocaine dries the cornea, however, and may cause a desquamation of the epithelium if used excessively.

Cocaine Poisoning

Here again, the possibility of drug poisoning must be considered, any signs of which should be reported at once. Some patients are extremely sensitive to cocaine and may have severe reactions.

Symptoms—The outstanding signs and symptoms of cocaine poisoning are an elevation in pulse and respiration, and a confusion of ideas and speech. The patient may become talkative and apprehensive, the skin pale, the perspiration excessive, and the pupils widely dilated. The condition may progress as it does not infrequently, and the patient is seized with violent attacks of nausea and vomiting, ending with delirium and coma.

Treatment should begin with reassurance to the patient, as usually they are apprehensive and generally alarmed concerning their condition. The patient should be put to bed and ice applied to the head, and at the first indication of collapse should be given stimulants.

Novocaine or *Procaine* is the only drug that can be used for deep anesthesia subconjunctivally, without producing toxic effects. Novocaine is an alkaloid similar in action to cocaine, but less poisonous; a solution of 2% is the percentage usually used. Its effect is not very lasting, wearing off in about 1½ hours. Frequently preceding an operation it is injected with a few drops of adrenalin 1-5000. It is in-

jected through the external part of the orbit in such a way that complete infiltration of the tissues will take place in this region.

For enucleation and tear sac cases, novocaine is used almost exclusively subconjunctivally as it paralyzes the lids and renders the iris less sensitive. Novocaine used in the operating room must be sterilized. (See under section on Sterilization).

Holocaine Hydrochloride is used primarily to allay pain in various eye diseases. Following injury, holocaine combined with an antiseptic is often used. As holocaine does not dilate the pupil, it is always used to desensitize the conjunctiva before measuring the tension of the eye. The usual solution strength is 1/8 to 1%.

VIII. MISCELLANEOUS

Dionin, a lymphogogue, is a derivative of morphine which relieves pain by its systemic action. In diseases of the cornea, dionin is given to promote the absorption of corneal opacities. When first instilled, it causes some irritation and the patient complains of a burning sensation but this, however, soon wears off.

Neutral Ammonium Tartrate, an irritant, is used specifically in the treatment of lime burns.

The lime as it unites with the conjunctival tissues forms albuminated lime, an insoluble substance upon which the neutral ammonium tartrate has a neutralizing effect. The corneal substance which has been corroded by the lime is of course very sensitive to the action of neutral ammonium tartrate, consequently there is terrific irritation and pain at each treatment.

The pain may be diminished somewhat by the instillation of 2 or 3 drops of cocaine or holocaine preceding each treatment, and if the pain becomes too intense, the same procedure may be repeated.

Neutral ammonium tartrate should be used undiluted in an eye cup in strengths of 4 to 20% solutions, depending upon the extent of the burn and the susceptibility of the patient. Allow the patient to hold the solution to the eye for 5 to 10 or 15 minutes, or as ordered by the doctor. A weak solution may be necessary at first, followed by a stronger one as soon as the patient has developed a tolerance to the treatment.

CHAPTER III

ABBREVIATIONS—INSTRUCTIONS AND PROCEDURES

The Latin abbreviations for right, left and both eyes are accepted universally by oculists. Besides the fact that these abbreviations facilitate and save time in writing orders there is also less danger of mistakes from illegible writing.

Oculus dexter, meaning right eye, is written as O. D.

Oculus sinister, or left eye, as O. S. and both eyes, or oculus uterque, as O. U.

To avoid serious mistakes, these abbreviations must be legibly written (printing is preferable) and clearly understood by the nurse.

Use of the Medicine Dropper

There are many facilities in use by which drops and solutions are instilled into the eyes, but the medicine dropper, which can be taken apart, thoroughly washed and boiled, is probably the most satisfactory.

In this institution (Massachusetts Eye and Ear Infirmary), our method of using droppers with rubber tops of different colors is somewhat different.

It is also probably the most convenient means of instilling drops and solutions into the eye, although there are varieties

of aseptic eye droppers in use. When individual bedside equipment is possible, aseptic eye drop bottles are the best, but in hospitals where treatments are done on a larger scale, such an arrangement would be impracticable, and the medicine dropper which can be washed and boiled repeatedly works out to the best advantage.

In this institution the system of droppers varies a little, with the classification of drugs. Droppers with different colored rubber tops are used—black for antiseptic drugs, red for mydriatics and cycloplegics and white droppers for myotics. For drugs which are not classified under the above headings use a black dropper. These special droppers should be kept separately from the others in a container labelled "special".

Care must be taken to wash the droppers thoroughly by disconnecting the rubber from the glass. Wash them in strong soap solution, rinse well and boil for 5 minutes.

Undesired reactions may result from droppers carelessly washed, when solution left in the dropper is allowed to mix with other solutions.

The used droppers should be kept in separate waste basins, one for each group, in which they are to be boiled. Mixing and boiling droppers together is considered a serious and dangerous breach of technique.

After boiling, the droppers are replaced in their respective containers.

The Mason jar serves very satisfactorily as a container. In the bottom of the jar a layer of absorbent or cellucotton should be placed to prevent the droppers from being cracked or chipped.

EYE TREATMENTS—INSTRUCTIONS AND PROCEDURE

1. Treatment Bed

If there is no treatment room, screen off a well lighted corner of the ward, where all patients who are up and about can come for their treatment.

The treatment bed should be one of average length, without iron framework at the head or foot. A table should be placed conveniently for the solution bowls and other equipment. A drop light is also a necessary part of the equipment.

FIG. 2.—Treatment Bed, showing equipment, and position of Nurse and Patient.

Only the nurse and the patient should be in back of the screen at treatment time. This will aid greatly in eliminating noise and confusion. The aisle between the bed and screen should be unobstructed to permit the patient to walk in and out conveniently.

Prepare the treatment bed in the following way:

Protect the mattress with a rubber sheet. Across the head of the bed, over the rubber, place a cotton half-sheet. Tuck in both rubber sheeting and cotton half-sheet securely.

Bedside Equipment

A medicine cabinet should contain all the necessary drugs for the treatments used. If this arrangement is not possible, the bottles may be kept on a large tray, covered with a towel. Arrange the solutions, cotton supplies, and waste basins on a convenient table or dressing carriage. Eight sterile enamel solution bowls arranged in the following order, are necessary:

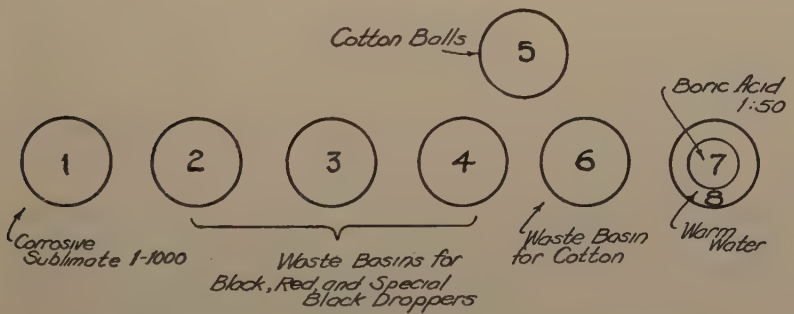


FIG. 3.—Arrangement of Solution Basins, for Eye Treatments.

A thorough inspection of the equipment before starting the treatments will prevent delays and loss of time later.

2. Charts

When there are a large number of patients to be treated, much time will be saved by collecting the treatment charts (all except those of bed patients and glaucoma cases) and bringing them to the treatment bedside.

3. Position of Patient and Nurse

For practical purposes and for unskilled hands it is best, (unless some cardiac or rheumatic condition contraindicates it) to place the patient in a dorsal position on the treatment bed. Nervous or feeble patients, particularly, can be treated to the best advantage in this way. With the patient in this position, the nurse stands at the head of the bed..

Children should be swathed securely in a blanket.

For office or clinical practice the patients are usually allowed to sit up erect in a chair, inclining the head backward against a head rest, while the treatment is administered. The nurse may stand either in back or in front of the patient in this case.

For bed treatment the nurse should, after removing all pillows but one, pull out the bed from the wall and stand in back of the patient.

It will be necessary for the students to become accustomed to the use of the left hand when treating the right eye since the use of the right hand in this case necessitates holding the right hand across the patient's left eye, and nose, which may be both uncomfortable and disagreeble to the patient. This procedure may require considerable practice before skill is acquired in manipulating the dropper. The right hand, of course, is used for doing left eye treatments.

In view of the fact that this particular branch of nursing concerns the most highly specialized organ in the body, the

necessity for exacting conscientious work is most imperative. Since eyesight is held most dear, patients are often apprehensive and nervous, which calls for the greatest patience and tact on the part of the nurse. Gentleness in manipulating the fingers about the eyes is essential—patients soon distrust the brusque, careless nurse.

4. Care of the Hands

It would be difficult to place too much emphasis upon the care of the hands, for the finger tips, nails and hands are always to be guarded against as a possible means of transmitting infection, and especially is this true in the care of the eye. One should always consider these possibilities of transmitting infection from patient to patient and from one eye to the other.

Scrub the hands thoroughly before touching the eyes, and dip the finger tips in bichloride 1-1000 between treatments. Small towels, upon which to wipe the finger tips, should be available for each nurse. These towels should be changed twice daily, at least, or more, if necessary.

After septic or infectious cases, of course, the hands should be scrubbed and then dipped in corrosive sublimate solution.

5. Technique of Opening Lids

This procedure is of extreme importance, as the slightest pressure on the eyeball in some cases may result in serious injury. When manipulating about the eye in the process of opening the lids, avoid as much as possible touching or causing pressure on the upper lid. This is especially true in post-operative cases.

With the index finger push down the lower lid, while

the thumb, resting on the eyebrow, raises the upper lid. If the patient is instructed to look towards the ceiling with both eyes open as widely as possible, it usually helps to hold the lids apart.

After the continuous use of ointments, the skin becomes very oily, making it extremely difficult to force the lids apart. A wisp of cotton placed under the thumb and index finger renders this procedure less difficult.

6. Inspection of the Eye

Inspect the eyes carefully, and if the infection is bilateral, treat the best eye first. If there is discharge, wash off the lids thoroughly with warm boric acid solution 1-50 before administering the treatment.

7. Holding the Dropper

Before using the medicine dropper, carefully inspect the glass tip for cracks and rough edges. Droppers with suspicious cracks should never be used, as glass particles may chip off as the solution passes through the glass lumen, and drop into the eye, causing serious damage to the cornea.

The medicine dropper should be held between the index finger and the thumb, in a horizontal position, resting on the nasal bridge. The third, fourth and little fingers should be spread apart resting gently on the forehead. As long as the dropper is supported on the nasal bridge, with the tip directed towards the outer canthus, the possibility of injuring the cornea is not great. Of course, using the dropper with the left hand is at first difficult for right handed individuals, but adeptness may be acquired with constant practice.

With a high nasal bridge, the dropper rests quite some

distance from the cornea, so that the solution strikes the cornea with too much force. This is irritating and uncomfortable and in some instances when the patient jerks his head may injure the eye. In such cases the hand in which the dropper is held should rest higher and in the center of the forehead, bringing the tip of the dropper nearer the eye.

8. Massage

At the present time massage of the eyeball is considered beneficial only in the treatment of glaucoma, after operations such as iridotases, iridectomies and trephines. Gentle massage with the finger tips is supposed to promote better drainage by keeping open the bleb. It is a dangerous procedure and must therefore be done with extreme care.

Place the first two finger tips gently on the eyeball, working them in a rotary motion for about 1½ minutes, which is usually long enough to establish drainage.

In the treatment of blepharitis, following the removal of the scales and crusts, it is extremely important of course to massage the lid margins with yellow oxide of mercury. In this case move the finger tips with a horizontal motion along the lid margins. If home treatments are to be carried out by the parents, proper instruction in this procedure must be given by the nurse, otherwise the massage will be of no benefit.

BEDSIDE TREATMENTS

Equipment

The solution bowls, cotton, droppers and drugs are carried to the bedside on a tray. If the patient is out of bed, it will be necessary to spread a gray blanket on the bed for the

patient to lie upon. This procedure is used particularly in the treatment of infectious and glaucomatous cases. (See Chapter 7).

Procedure—Patient in bed.

Remove the backrests and all pillows except one. Pull the bed out from the wall and stand in back of the bed while doing the treatment. As a protection to the pillow, hold thick pads of cellucotton at the side of the patient's head during irrigations.

After the treatment replace the pillows, backrest, etc., and leave the patient as comfortable as possible.

Procedure—Patient out of bed.

Remove the pillows and spread a blanket on the bed. The patient should lie with the head at the foot of the bed so that it will not be necessary to move the bed.

Precaution Cases

Gonorrhoeal conjunctivitis; pneumococcus conjunctivitis, and trachoma.

An individual equipment tray, solution bowls, droppers, blanket, etc., should be kept at the patient's bedside when precautions are observed. The equipment should also be sterilized separately and replaced following the treatment.

CHAPTER IV

APPLICATIONS AND TREATMENTS

1. Lotions

Lotions and eye washes are used chiefly as irrigating or cleansing agents. They are applied usually by means of a medicine dropper or an eye cup.

Irrigations—Draw up the lotion in the dropper and, holding it in the same position on the nasal bridge as outlined in Chapter III, begin the irrigation at the internal canthus, that is, hold the dropper so that the solution will flow across the entire anterior surface of the eyeball, catching the return flow at the outer-canthus.

Boric, which is most commonly used, should be about body temperature, since cold solutions in the eye are extremely uncomfortable and are not absorbed as readily. To avoid burning the patient, first test the solution on the back of the hand for temperature. Use as freely as is necessary to wash out thoroughly the eye.

2. Drops

Drops and lotions are instilled into the eye in very much the same way except for the quantity used. Drops are not used as irrigating agents or as eye washes but for the local effect upon the tissues. Mercurochrome, atropin and holocaine, for example, are classified as drops.

As the drops are taken out of the bottles, hold the stopper in the left hand to prevent contamination by its contact with the table. Only as much solution as is necessary for the treatment of both eyes should be taken up at once. The solution remaining in the dropper after the treatment should not be returned to the bottle, but should be thrown out.

Usually only one or two drops should be instilled into the eye at one time, for as a rule the culdesac will not hold more than this without flowing over the lid margin.

Allow the drop to fall on the center of the lower lid. After each instillation the patient should be instructed to close the eyes in order to promote the absorption of the solution.

3. Powders

Drugs in the form of powder are not used as extensively as those in solution form. Powders are best applied by a carefully made toothpick swab. The swab covered with powder should be rotated on the lower lid with great care so as not to abrade the tissues.

In the treatment of eye diseases, calomel and nosophen are the only drugs which are usually applied in powder form.

4. Ointments

When the lacrimation or tearing is excessive, drops are not very effective. In treating these cases, ointments are extremely valuable because it remains in the culdesac for a longer time and consequently the effect of the drug is sustained. Ointments are also used as a protective coating to prevent the lids and lashes from adhering in cases where there is a heavy exudate present, or when the lids are abraded.

To facilitate the application of ointments they are prepared in tubes with a special "eye" tip. The ointment comes out of the tube thin and ribbon-like. Ointment put up in other containers necessitates the use of a toothpick swab, it being applied in the same manner as a powder.

It is extremely important in the manufacture of ointment for use in the eyes that none but the best materials be used.

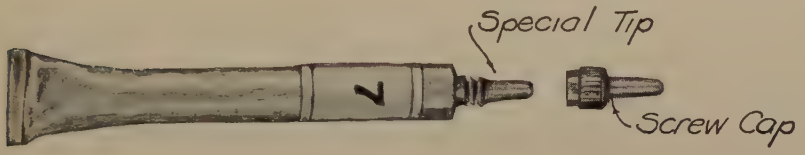


FIG. 4.—Ointment Tube, with Special Eye Tip

The base should be of such consistency that the ointment will not roll out of the culdesac readily. Of course the ointment should be free from all particles of grit which would act as foreign bodies.

Except for the treatment of a local skin condition, or as a protection to the skin preceding the application of fomentations, ointments should be applied within the lids directly into the culdesac.

Begin at the external canthus outlining the margin of the lower lid. At the internal canthus, give the tube a sharp turn in the opposite direction to end off the ointment. Drop the tube on a cotton pledget placed conveniently and pull down the upper lid over the lower, releasing it quickly.

In post-operative treatments, ointments must be applied very carefully because of the absence of the lashes. In-

stead of pulling down the lashes, gently work the two lids together with the two thumbs in order to spread the ointment over the surface of the eyeball.

After using certain ointments, such as nosophen, wherein a large amount of powder is dissolved, the lumps of hardened powder will be observed on the lids. Unless these are completely washed off before a new application, a local irritation may be caused.

5. Compresses

a. Hot Compresses—There seems to be some doubt as to the efficacy of heat, applied in the form of compresses to the eye. In acute inflammatory conditions, heat undoubtedly helps to allay pain and it promotes absorption when used in connection with other drugs. It stimulates the circulation, thereby increasing the blood supply to the affected part.

FIG. 5.—Hot Fomentation Equipment

Equipment—The necessary equipment for the application of hot compresses is:

Boric sol 1:50
2 Throat sticks
Boric Ung. (To protect skin)
5-6 Cotton balls
Foment cup
Foment mat or small enamel tray.

Procedure—In the foment cup place the solution, throat sticks and cotton balls. Boil for 5 minutes. Fomentations precede all other treatment.

Before the application of fomentations, apply an ointment of some kind to prevent burning the lids and surrounding area. On old feeble patients or those in bed, and on all children, the nurse should apply the foments. Patients out of bed who are intelligent may be taught this procedure very satisfactorily.

If there is any discharge, wash off the eyes with warm boric before applying the foments. After this the pledgets may be used repeatedly. A cotton pledget is taken up between the two throat sticks, pressing out as much solution as possible before holding it to the eye. The length of time of applying hot fomentations ordinarily is about eight minutes, for usually after this the solution is not sufficiently hot to be effective. If the treatment calls for a prolonged application, the solution must be repeated at intervals. For constant hot applications an electric stove plugged in at the bedside is very convenient.

b. Iced Compresses—The use of iced compresses varies. Except for acute inflammation of the lids, accompanied by

marked swelling, they are used very seldom in the Massachusetts Eye and Ear Infirmary.

Equipment—The following equipment is necessary:

White enamel tray
1 small agate basin for waste
1 medium size enamel container for ice
Vaseline
Folded towel for square of gauze
Block of ice 4 x 6 inches
Cotton or gauze pledgets
Paper bag—for waste.

FIG. 6.—Iced Fomentation Equipment

Procedure—Likewise as for hot fomentations protect the skin by the applications of vaseline. The pledgets should be arranged on the ice in two rows if one eye is being treated, in four rows if both eyes are to be treated. Apply them constantly for about 10 minutes, unless otherwise ordered.

The folded towel or gauze is placed in the bottom of the basin to prevent the ice from moving about and striking against the sides of the container. Sometimes a solution

of boric acid or witch hazel is ordered. If so, about 10 ounces of the solution is poured over the ice. This solution, however, is not always necessary, as the cotton soon absorbs the moisture from the ice. Cracked ice may be used in place of the block ice if more convenient.

The lids should be washed off with boric acid solution before the application of the fomentation, and as the pledgets are used they should be dropped into a waste container or paper bag.

6. Inunctions

Purpose—Mercurial inunctions are given frequently in connection with the systemic treatment of certain diseases of the eye, caused by lues, such as interstitial keratitis and luetic iritis. USP mercury 50% is the preparation ordinarily used and the dose is usually from 15 to 60 grains, depending upon the severity of the disease. Opinions vary, however, concerning the value of the treatment.

Procedure—A small quantity, about the size of a pea, should be rubbed thoroughly into the skin. It is usually given on five successive nights, discontinued for the next three nights, and then again resumed, selecting a different spot on alternate sides of the body and each time, preceding the treatment, scrubbing the area with soap, water and alcohol. The popliteal and cubital spaces or the axillas are usually selected because the skin is thinner, and for that reason, the mercury is absorbed more readily. Portions of the back around the shoulders, however, may be used. Rubber gloves should always be worn by the nurses to protect themselves from absorbing the mercury through the finger tips.

It is important to observe the patient for toxic symptoms

which are the same as for mercurial poisoning from other forms of the drug. The patient usually complains of a metallic taste in the mouth, followed by a profuse flow of saliva. These symptoms may be followed by soreness and bleeding of the gums, dermatitis, and in some instances, kidney complications if the poisoning is severe. Of course, any of these manifestations would indicate a discontinuation of the drug and an immediate report should be made to the doctor.

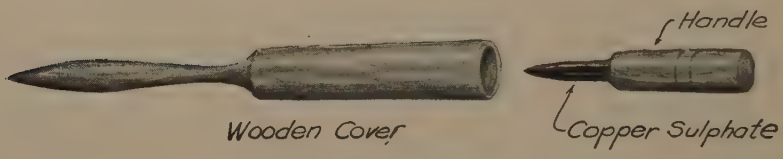


FIG. 7.—Copper Sulphate Stick.

7. Copper Sulphate Stick

Copper stick or "Blue Stone" forms the chief treatment of trachoma. In such cases it is rubbed on the palpebral conjunctiva of both upper and lower lids. It acts as a caustic which shrinks or wears down the nodules which characterize the disease. The frequency with which it is used depends upon the severity of the disease, but usually, once daily, at least during the acute stage, is necessary.

A drop or two of holocaine to deaden the intense pain is often given, preceding and following a copper treatment.

Nurses are not frequently called upon to give such

a treatment, except in private practice, but it seems important, however, that they should be familiar with the procedure.

Procedure—Evert the lid with a toothpick swab, or the blunt edge of a throat stick; then carefully rub the rounded end of the copper stick over the everted lid. The same treatment is given to the lower lid.

8. Alum

In pencil form it is used chiefly for chronic conditions of the conjunctiva. It has much the same effect as copper, except that it is less caustic. It is rubbed on the palpebral conjunctiva in the same manner as the copper stick.

9. Eye Cups

Eye cups may be used effectively to bathe the eyes in milder inflammatory conditions of the conjunctiva. Boric acid 3%, astringents and other healing lotions are used most commonly. Each patient should have his individual cup, which should be boiled and kept ready for use at the bedside.

Fill the eye cup with solution to about 1/4 inch from the top, then with the head slightly lowered, place the edges of the cup to the lids. The eyes should be opened as widely as possible so that the solution bathes the entire anterior surface of the globe. After this step, the patient should lie in the dorsal position for 5 minutes, at least, or as ordered—until relief is obtained.

Neutral ammonium tartrate should be used in an eye cup. It is an extremely painful treatment and on this account the constant supervision of the nurse is always necessary because of the tendency of the patients to slight it.

10. Hot Packs—Pilocarpine Sweats

The use of hot packs and pilocarpine sweats in the treatment of eye diseases is limited. Hot packs, however, with the injection of pilocarpine either subconjunctivally or subcutaneously may in some cases assist in the elimination of toxins.

Procedure—After the injection, the same routine is followed as when giving hot packs for any systemic condition. Wrap the patient in warm blankets and place hot water bags around the body, and an ice cap to the head.

Pilocarpine sweats are particularly dangerous for elderly people. The pulse should be noted frequently and at any indication of unfavorable reaction, remove the patient from the pack and at once notify the doctor.

11. Leeches

Blood letting or the use of leeches is another form of treatment not much in use at the present time, but here again, in an emergency, a nurse should know how to apply them properly.

Sometimes they are used to reduce inflammation in severe cases of iridocyclitis, or other deeply seated inflammatory conditions, and rarely in cases of episcleritis. Also, as an adjunct in the use of mydriatics to break up posterior synechia, leeches may be applied. (Fuch).

Procedure—One to three leeches is the number usually placed on the temple at one time. Care should be taken not to place them too near the eye lid. Also, as a protection the ears should be plugged with cotton and a towel wrapped securely about the head. To be of real benefit, leeches must be active and not sluggish, otherwise they will not take "hold." First, prepare the area with soap and water before

the leech is applied. Sometimes it may be necessary to scrub the skin vigorously to bring the blood to the surface and get the leech started. Hold the leech in a test tube or jar, the mouth or open end of which is held against the temple. If there is no suitable receptacle, a folded towel may be used in which to hold the leech.

Usually a leech will drop off as soon as it is engorged with blood, but if removal is desired before that time, apply a little salt near the mouth of the leech. The skin should be washed with alcohol after this process and a small collodion dressing applied. If persistent bleeding follows the removal of the leech, it should be reported at once to the doctor.

CHAPTER V

APPLIANCES, TREATMENT AND SURGICAL SUPPLIES

Bandages

In the treatment of eye diseases there are many uses for the bandage as a protection against infection following operation and as a means of holding the surgical dressing in place. The discomfort of a foreign body in the eye will be relieved by a bandage. This limits the motion of the lids and prevents scratching of the cornea with the continuous movement of the lids. The bandage also prevents the patient from irritating and handling the eye unnecessarily in the attempt to remove the foreign body.

Pressure Bandage

The pressure bandage is used chiefly after cases of enucleation to maintain pressure against the excavated orbit and thereby to lessen the danger of hemorrhage. Also, after operations on the tear sac, the pressure bandage assists in forcing the tissues back in place.

In bad cases of corneal ulcers when a perforation threatens, the pressure of the bandage against the sloughing ulcer renders support.

Application

Bandages must be applied securely with the idea of performing the special function for which they are intended, and with the comfort of the patient in mind. Make every

turn count as the bandage is wound about the head. The bandage which is loosely wound about the head is uncomfortable to the patient and also, it fails to hold the dressing in place properly. To improve the appearance it is well to turn in all the raw edges. Start the bandage with the roll on top in the hand.

1. Single Bandage

Stand in front of the patient and place the eye pad with the compress side next to the eye. Next start the bandage

FIG. 8.—Single Eye Bandage.

over the ear, opposite the affected eye, turning in the lower edge. For example, to bandage the right eye, hold the roll in the left hand, and start the bandage over the left ear; reverse the procedure for the left eye.

Make two turns around the head, turning in the lower edge and each time carrying the bandage well down under the occiput. A third turn starting at the nape of the neck is then brought up across the top of the head a little to the left of the midline. Turn in the upper edge and at the junction of the forehead and nasal bridge turn in the lower edge. This turn, which continues down below the superior maxillary and under the ear, fixes the lower edge of the eye pad. Under the ears turn in both edges, which makes the bandage narrower, and consequently more comfortable under the ear lobes.

After the pad is fixed, alternate turns around the head, up over the head and down over the eye pad, filling in the space between the two turns. Continue this until the pad is completely covered, remembering not to use more bandage than is absolutely necessary.

Finish the bandage by turning in both edges on the final turn around the head. Fasten with a narrow strip of adhesive.

2. Double Bandage

The double bandage is used when both eyes are to be bandaged.

Start the double bandage in the same manner as the single, over the right or left ear.

The first two turns about the head are the same as for a single bandage. The third turn begins at the occiput and continues up under the ear and over the cheek to the nasal

bridge. This turn will hold the eye pad in place. Carry the bandage across the head turning in the upper edge and circle once around to the middle of the forehead. Then turn in the lower edge, where the bandage crosses at the nasal bridge, and going downward, catch in the other eye pad. This is continued under the ear to the occiput (turning in both edges under the ears to make it more comfortable). Alternate turns around the head and over the eyes, until the pads are entirely covered and end off the bandage with adhesive plaster. It will save time and promote efficiency if the adhesive strips are all cut and ready for use, before starting the bandage. The bandage when it crosses the nasal bridge should be true in perfect line.

3. Pressure Bandage

It is most important in the application of the pressure bandage to see that sufficient pressure is exerted. Johnson's Crepe Elastic bandages, about 2½ inches in width, are very satisfactory. These may be washed, boiled and used again.

The foundation of the pressure bandage is formed by the ordinary eye pad (compress side next to the eye) over which are placed several cotton balls wrung out of warm boric solution. Loosen the moistened cotton and thin it out in the center, thus forming a concave-like pad which molds itself to the eyeball. The wet cotton adheres more closely to the eye pad and thereby creates more pressure.

Next, tear a piece of adhesive about 8 or 9 inches in length and place its plaster side upwards on the head, letting one end hang down opposite the eye to be bandaged. This adhesive, when the bandage is complete, serves to hold it in place, preventing it from slipping down over the other

eye. A small amount of cotton may be placed behind the auricle of the ear. This usually adds to the comfort of the patient.

Begin under the ear on the same side as the eye to be bandaged and continue upwards across the cheek to the nasal bridge and over the head. This turn is carried downward under the lobe of the ear and up a second time. These two turns are important, as they hold the pad and the dressing in place.

Each time the bandage is brought up from under the ear, pull it as tightly as possible across the eye. The turns around the head act merely as anchors and do not need to be put on very tightly.

Fasten the end of the bandage with a safety pin, as adhesive plaster will not hold it securely. The last step is to fasten the lower end of the adhesive to the forehead. This will prevent the bandage from gradually slipping or working out of place.

4. Eye Ties

A single or double eye tie (a covering for the dressing) may be substituted in some cases for a bandage, to hold on a dressing.

a. Single

The Derby tie which will be described has given complete satisfaction and has been adopted by the Massachusetts Eye and Ear Infirmary. There are undoubtedly other types worthy of mention but it is not the type or the style of the tie with which we are chiefly concerned, but the manner in which it holds the dressing in place. A tie which slips down over the patient's face constantly, loosens the dressing and is

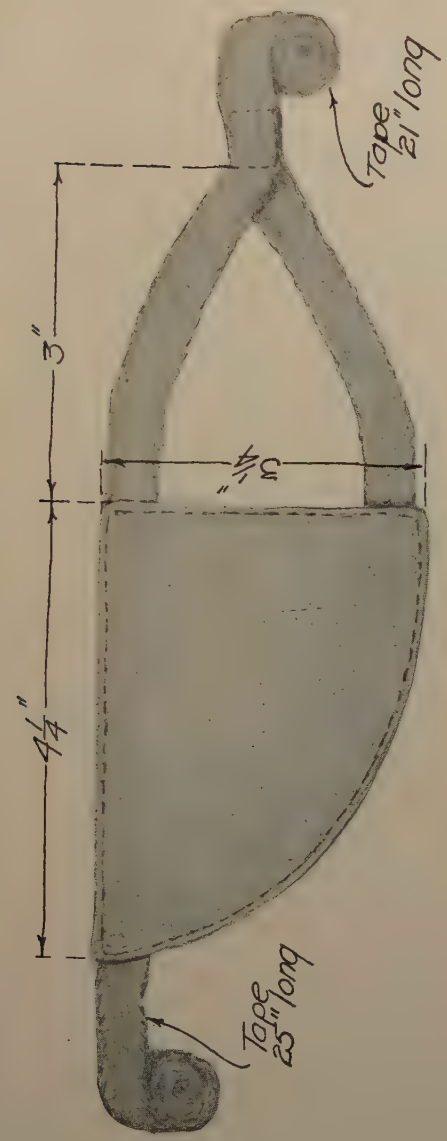


Fig. 9.—Derby Tie.

not only uncomfortable but it enables the patient to touch the eye easily.

To Make

A good quality of cotton cloth should be used (*Fruit of the Loom* is suggested) at least of the kind which will withstand the laundry wear. (The completed eye tie is shown in Fig. 9.) Double the cloth on the fold and measure off 3½ inches from A to B and 4 inches from A to C.

Cut carefully and turn in the edges on all sides except on the fold, baste, and stitch firmly. The ties consist of two pieces of linen tape each about 24 inches long, which are attached at A and to C. From B is attached a tape of 4½ inches which is joined to C at D. Ties which are made with the above dimensions will be long enough to fit the average patient.

b. Double Ties

Our cataract bandage is very satisfactory to use, not only after cataract extraction, but for any case wherein both eyes are to be bandaged. It is made from heavy cotton thread, knitted into a band of about 5¾ inches in length and 33 inches wide. The tie will give more support and will not stretch quite as much if plain and purled stitches are used, about six of each, alternating. A drawing of the double tie is shown in Fig. 10.

At A and C, sew on seven inches of tape. At B and D the tapes should be about 24 inches long, in order to pass under the head and tie at the side with A and C.

For post-operative cataract patients, especially, this type of tie is very convenient as the long ties are passed under the head of the patient without moving the head from the

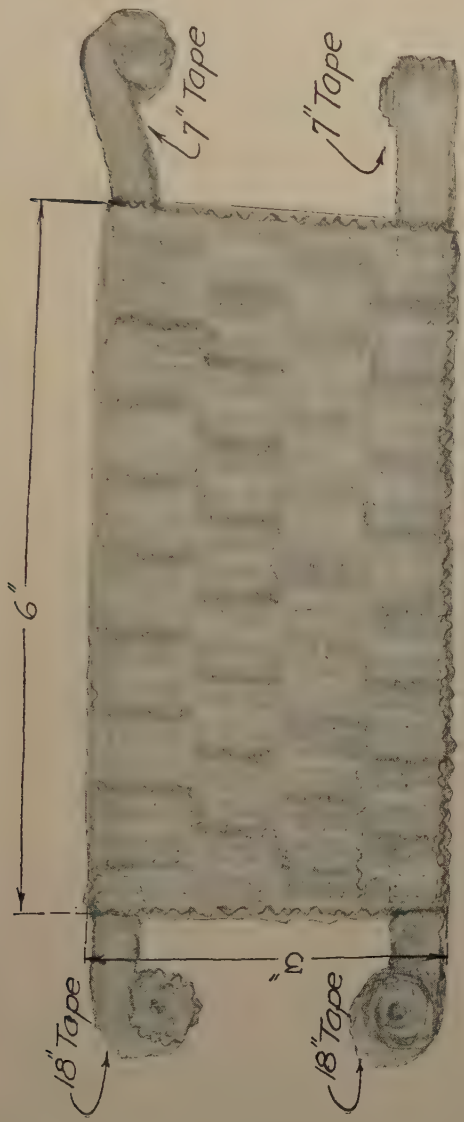


Fig. 10.—Knitted Double Bandage.

pillow. They should be tied on the opposite side of operation. The bow knots are tied more conveniently on the side, and also allow the patient to lie on his back and to be turned on his side without the discomfort of the hard knots on the back of the head. These knitted ties may be washed and boiled in soap solution before using again on other patients.

5. Dark Glasses

For comfort, patients with marked photophobia should be given dark glasses to wear. After cataract operations, they are usually ordered by the doctor on the eighth day, when both eyes are uncovered. With the dark glasses a green shield is worn as an additional protection from the light. The green shield is similar to the ordinary reading shield.

The chief responsibility of the nurse when dark glasses are ordered is to see that the patient wears them continually.

6. Eye Pads

Eye pads for the most part are made of absorbent cotton and covered with a layer of compress, thin gauze, or muslin.

a. Single

Procedure—To make these pads or dressings the proper size, cut out a cardboard pattern, the usual size of which is 2½ inches across the top and 3 inches from the top to the round end or bottom.

Eye pads should not be too thick or too thin—the former, of course, makes a bulky dressing and wastes the cotton, while the latter would be of very little protection to the eye.

Rolls of cotton vary in thickness. In all cases, however, they may be separated into halves and not infrequently into

thirds. Ordinarily the cotton is divided easily by taking it up with the finger tips. Unroll the cotton to its full length before separating it. A long table, bench, or bed which is protected by rubber sheeting, or a thick layer of newspaper facilitates the handling of the cotton.

Save the blue paper in which the cotton is rolled, as it is an economical way of supplying the bottom layer of the eye pad, and in addition lessens the difficulties in making the pads and manipulating the cotton. Also when eye pads are packed into containers preparatory to sterilization, paper between them prevents the cotton and compress from becoming separated. Of course, the paper is removed at the time of the application to the eye.

The compress or top layer is laid on over the cotton. The next step is to cut the cotton into strips, the width of which depends upon the measurement of the eye pad. Measure the pattern from top to bottom and cut the entire roll into strips of the same measurement.

After this process, carefully place the cardboard pattern and cut around it. The pads should be cut as carefully and as economically as possible.

Procedure

b. Double eye pads are made by moving the pattern and cutting around it twice. Pads made for children should be made somewhat smaller. Old sheets and linen that is clean and soft may be substituted for regular compress, but care should be taken to use that which is free from holes and stitching, hems, or rough places in the material which would be irritating to the eye.

In applying, use strips of Johnson's silk isinglass plaster in place of the bandage to hold the pad in place. Moisten

the mucilage side with water and place over the pad, leaving about 1¼ inch margins above and below to fasten on the forehead and cheek.

7. Cotton Balls

The cotton balls which are used so much in doing eye treatments are not in the least difficult to make, although there are one or two points necessary to remember to prevent a waste of cotton, and to make the pledgets a convenient and uniform size.

Procedure—Pull off the cotton lightly, taking a piece about the size of a half dollar, in the centre of which place another piece half its size. Then with the index finger of the right hand force the cotton through the ring made by bringing together the thumb and index finger of the left hand. Moisten the finger tips in water and twist the fuzzy ends of the cotton.

Cotton balls made this way will be of a convenient size and will readily absorb solutions.

8. Buller's Shield

The Buller Shield has its application in the treatment of gonorrhoeal conjunctivitis when the infection is unilateral, as an effective preventive measure to the unaffected eye.

This shield is more comfortable and dependable than a bandage, primarily because of the secure manner in which it is applied to the skin. In addition, the shield not only protects but allows the patient the use of the well eye. It also enables the doctor to observe the eye closely.

The details of the nursing care of gonorrhoeal ophthalmia will be discussed further in Chapter VI, but it should be known at this point that one of the chief factors in the

treatment of this disease is the application of the Buller's Shield as soon as the diagnosis is made. This holds, of course, when the infection is unilateral only, serving as a safe guard for the unaffected eye. It is therefore of the utmost importance that all nurses should know the use of Buller's Shield—how it is made and how to apply it.

Directions and Procedure

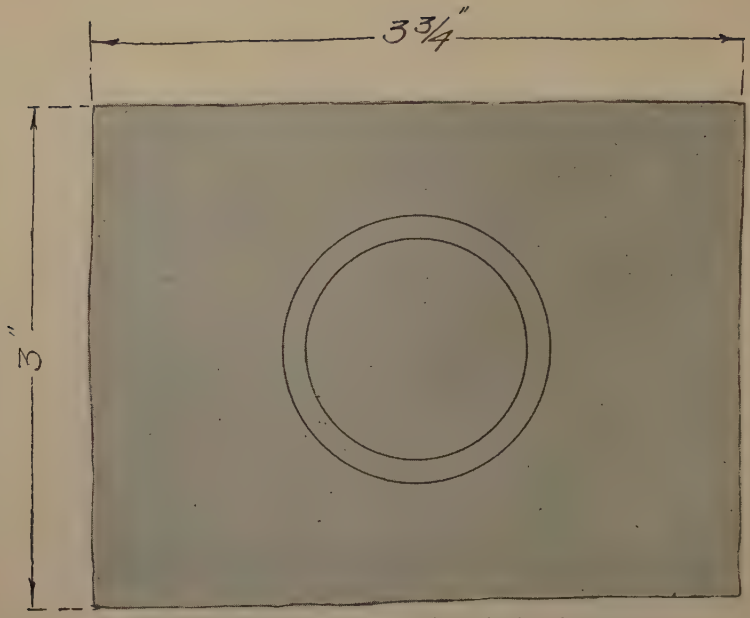
The following equipment is necessary to make a Buller's Shield:

Adhesive 3 x 3¾
Watch crystal 40 m.m. in diameter
Absorbent cotton
Flexible collodion and applicator

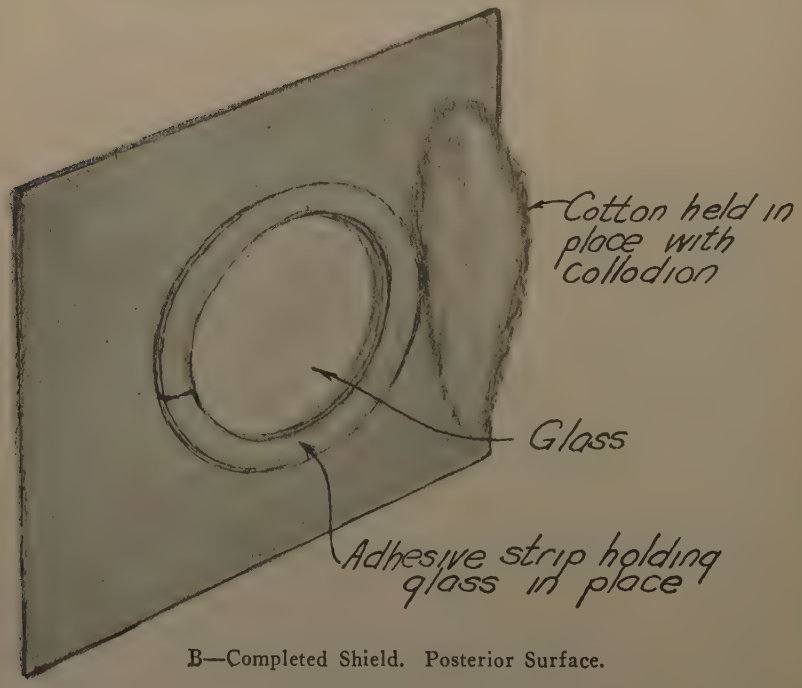
To facilitate the manipulation of the adhesive, place the equipment on a table with a glass or enamel top, otherwise the adhesive sticks to everything, including the finger tips, and becomes difficult to handle. Cut the adhesive the proper dimensions and place it, adhesive side down, on the table. The dimensions of the shield may vary in small limits according to the size of the patient's face.

Place the watch crystal in the center and draw a circle around it very lightly in pencil. At about 3/8 inch inside the circle, draw another, cutting out that area within the smaller one (this piece should be saved to be used in covering the rough edge of the crystal on the posterior surface of the shield). The watch crystal is now placed over this opening, with its convex surface fitting into it in such a way that the shield adheres to the watch glass around the edge of its convex surface.

With the circle of adhesive which is left, make a thin



A—Adhesive before cutting the hole for the glass.



B—Completed Shield. Posterior Surface.

FIG. 11.—Buller's Shield.

strip about 3/8 inch wide by cutting straight in from the edge about 3/8 inch and then cutting around parallel to its edge. This strip is used to cover the rough edge of the glass on the posterior surface of the shield. If this were not done, the raw glass edge would come in contact with the eye. The next step is to make a padding for the bridge of the nose. The purpose of this is to fill in the depression at the side of the nose so as to prevent secretions from running across the nose into the unaffected eye.

A piece of cotton rolled to a thickness of ¼ inch and about 1¼ to 2 inches in length is fitted to the bridge of the nose. The upper surface of the cotton is held down by the plaster, while the raw edges, which are nearest the affected eye, are painted down with collodion. This, of course, makes the bridge entirely moisture-proof.

A tiny opening is made in the shield for the necessary ventilation. On the outer edge of the shield at about the level of the outer canthus, cut out a piece of the adhesive about 3/8 x 3/8 inch. This opening must be small enough so that the smallest finger cannot be admitted, as often the patient attempts to scratch the eye if it is possible to get the finger inside the shield.

Application

Place the center of the watch crystal in direct line with the pupil so that the central vision is unobstructed, then place the artificial bridge (which is already adherent to the adhesive plaster) to the nose, and fit it in place as firmly as possible. First the upper edge of the plaster is pressed down firmly, then the lower edge, followed by the edge next to the nose. Finally the external edge is attached to the side of the face.

Care must be taken that the opening at the external canthus does not come in contact with the skin, else the ventilation to the eye will be cut off entirely. Now, the lower edge is fastened to the cheek. Outline the border of the adhesive all around (except at the opening) with thin strips of cotton and flexible collodion, making the shield secure and moisture-proof. A piece of cotton should be placed over the opposite eye for protection while the collodion is being used.

Before putting on a Buller's Shield, the eye should be thoroughly examined subjectively and objectively by the doctor for any indication of inflammation or discharge. If the patient complains of an itching or burning sensation, or as if a foreign body were in the eye, a shield should not be applied.

As long as a Buller's Shield is worn, the eye should be under constant supervision for manifestations of any of the above symptoms. This, of course, would indicate an immediate removal of the shield. Treatment must be started immediately the infection is detected, for if this process continues for several hours, without treatment, the condition will progress, resulting in serious and irreparable damage to the cornea. The importance of carefully watching the protected eye for signs of infection is evident.

Removal

Before the shield is removed, the treatment should be discontinued for 24 hours and a smear taken. Two more are taken twenty-four hours apart. When there are three negative reports, the shield may be safely removed without danger of infection.

If the edges of the shield are moistened with benzine or ether, it may be removed more easily.

9. Artificial Bridge

The Buller's Shield cannot be used effectively on infants and small children with these infections, but an artificial bridge can be used in its place. This consists of a roll of cotton about ¼ inch in thickness, the length of which is fitted to the natural curve of the nose. It should be rolled firmly and then painted with flexible collodion to make it moisture-proof. Protect the eye with cotton when using the collodion.

The purpose of this appliance is the same as the Buller's Shield—to protect the well eye. It is very essential that the bridge should be high enough to prevent pus and secretion from running over and into the well eye.

As soon as the secretions have subsided and there have been three negative smears, the bridge may be removed.

CHAPTER VI

EYE DISEASES. SPECIAL POINTS IN TREATMENT AND NURSING CARE

An elementary knowledge of the common eye diseases, the general classifications, modes of infection, pathology, etc., is necessary in order that the student may understand clearly the special forms of treatment and the nursing care common to such conditions.

The external diseases of the eye, the lids, the glands, the conjunctiva, etc., will be considered first, followed by diseases of the internal eye.

ANOMALIES OF THE LIDS

Ptosis

Ptosis of the upper lid is usually classified into two groups, congenital and acquired.

Congenital Ptosis may be due to a paralysis or a mal-development of the levator muscle. It is most frequently evidenced in both lids. Not frequently it is transmited by inheritance through several generations. (Fuch).

Acquired Ptosis is commonly caused by injury of the innervating nerve or of the muscle. It may occur as a complication of trachoma, or it may accompany lid tumors. Syphilis is also an important cause.

Treatment—The first consideration in the treatment of

ptosis is the determining and removing of its cause. In the congenital form, surgical procedures are necessary.

Trichiasis

Trichiasis is simply an inversion of the cilia so that they rub against the cornea.

Etiology—This is a condition usually caused by a contraction of the palpebral conjunctiva following cases of trachoma. Trauma is another cause.

Symptoms—Constant friction of the cilia against the cornea creates an irritation with lacrimation, pain, photophobia and conjunctival injection.

Treatment—Epilation (removal of eye lashes) is the first treatment usually employed. If the misdirected cilia are few in number this procedure ordinarily effects only temporary relief as the lashes grow in a short time. Although extremely painful, electrolysis is sometimes done to effect a permanent cure.

Distichiasis is a congenital condition in which there are two rows of cilia one of which is directed outward in the normal way and the other toward the cornea. The treatment is surgical.

Ectropion

Ectropion, or eversion of the lids, is frequently seen in old age. It almost always occurs in the lower lid.

Etiology—Injury, burns, scar tissue, epiphora, and chronic conjunctivitis are among the common causes.

Symptoms—The chief symptom is epiphora because of the everted puncta. In extreme cases the exposed cornea may become irritated. If this occurs there is usually conjunctival irritation.

Treatment—Non-operative measures consist of the ap-

plication of a pressure bandage which forces the tissues of the lower lid against the globe holding them in place. Strips of adhesive fastened to the cheek and to the nose and forehead may also be tried in attempt to hold the lower lid in place. This is rather ineffective, however, as the tears as they are constantly rubbed away, cause the adhesive to loosen and consequently slip out of place. Massage of the lower lid in an upward direction towards the inner canthus may be effective in the treatment. Surgery is about the only treatment which will effect a permanent cure. A piece of the lid may be removed thereby shortening the lid margin.

Entropion

With this condition the lid margins are inverted. The lashes are also turned in and rub against the cornea.

Etiology—A spasmodic contraction of the orbicularis muscle may produce entropion. It can be induced by too tight a bandage. Cicatricial contraction of the palpebral conjunctiva following injury is another cause.

Signs and Symptoms—The symptoms are similar to those of trichiasis. The patient has pain, lacrimation, photophobia, conjunctival injection and a corneal irritation.

Treatment—The removal of the bandage will sometimes clear up the entropion of the spasmodic type. A piece of adhesive about ¼ inch wide attached as near the lid margin as possible, pulled tightly, and fastened below under the mandible, will sometimes hold the lid in place. The pressure must be constant, however, and therefore the adhesive must have good sticking qualities.

EXTERNAL DISEASES OF THE EYE

Stye or Hordeolum

A stye is an acute inflammation of a Zeiss gland. These glands are found at the base of the hair follicles on the margin of the lids. Styes may occur singularly or in groups on either lid or both. Staphylococcus is the usual causal organism.

Symptoms—The symptoms consist of a localized swelling, pain, tenderness, and redness. The swelling may extend along the margin of the lid.

Etiology—Debility, refractive errors, and systemic disturbances are predisposing causes of the stye.

Treatment—With early treatment as soon as the redness appears the infection may be aborted by the application of cold boric or saline compresses every two hours. If the treatment is not instituted early, the swelling progresses. Abortive treatment is then useless, and the application of heat is indicated. Continue this treatment until the abscess comes to a head. Then incise and drain. To promote drainage and reduce the swelling, continue the compresses every two hours until the following day. The heat also has a soothing effect and makes the patient more comfortable. Drops of an antiseptic or an astringent solution such as zinc sulphate, argyrol 20%, or mercurochrome 1% are usually prescribed. In addition to the local treatment any suspected focus of infection should be treated and removed. The patient should also be refracted, particularly if there is a continual recurrence.

Chalazion

A chalazion is a non-inflammatory swelling or cyst caused by a blocking up of a duct of a Meibomian gland.

Symptoms—It is first noticed as a slight swelling appearing most commonly on the upper lid. This progresses, increasing in size until the chalazion is as large as a small pea, before the patient experiences any discomfort from the pressure. It is usually because of cosmetic reasons however, that they consult the doctor. If the cyst becomes infected and breaks down, involving the surrounding tissues, it is known as an internal stye. (Meibomian hordeolum).

Treatment—The treatment is much the same as for styes; the cyst is incised and the contents (sebaceous in appearance) evacuated. Incompete curettement will cause the chalazion to recur. Local anesthesia is used, two or three drops of holocaine 1%, and injections of novocaine 1 or 2% with adrenalin 1-1000 injected around the area of operation.

Post-operative care consists of a continuous hot compress for 24 hours in conjunction with an antiseptic solution of some kind such as zinc sulphate or argyrol.

Pterygium

A pterygium is a thickening of the conjunctival membrane usually triangular in shape, which starts at the inner canthus and progresses slowly toward the center of the cornea. Pterygium may occur in one eye or in both.

Etiology—It is seen in elderly or middle aged individuals who are exposed to irritating atmospheric and occupational conditions. The growth itself originates from a pinguecula which enlarges pulling the conjunctiva with it as the process extends toward the cornea.

Symptoms—The chief symptoms are the thickened and vascular membrane and slight conjunctival injection. Not until the growth reaches the pupillary opening is the vision disturbed.

Treatment—The treatment is surgical, and the membrane is dissected off the cornea and transplanted under the normal conjunctival in the lower culdesac. It is held in place by suture. After the operation the culdesac is filled with White's or boric acid ointment and a sterile pad applied.

The day after operation the wound is dressed and some form of local antisepsis prescribed.

Blepharitis Ciliaris

Blepharitis is an inflammation or an irritated condition of the lids characterized by the formation of granules or pus. It is classified under two main headings, blepharitis squamosa and blepharitis ulcerosa.

Etiology—External causes such as irritation from air. dust, wind, smoke and lack of sleep following exanthemata may also cause blepharitis. Systemic disorders also play an important part in the cause of blepharitis. Refractive errors, debilitation, unhygienic surroundings and scrofula are other predisposing causes.

Blepharitis Squamosa (Non-ulcerative)

The lids are red and swollen in this type and in addition, small ulcers form on the lid margin which bleed when the scales are removed. In this type the lashes fall out and are not replaced. In both types of blepharitis the lids are very sore and itchy and stick together in the morning; there is also photophobia.

Treatment—The first consideration in the treatment of the various types of blepharitis is local cleanliness. The lids should be cleansed thoroughly and every scale removed using solution of water and soda bicarb, or plain soap and water. A toothpick swab or a tiny brush dipped in the solution will facilitate the removal of the crust. Sometimes vigorous rubbing will be necessary. In persistent cases, swab warm glycerine on the lids and allow it to remain over night. This will soften the crust and facilitate removal. Yellow oxide of mercury 2% should be massaged into the lid margins thoroughly after the scales have been removed. This is important, and nurses should be certain that the patients are properly instructed in this procedure.

In addition to the local treatment the general condition should be treated and any foci of infection investigated. The eye should be examined and refractive errors corrected. Give the patient plenty of fresh air, sunshine and a nourishing diet.

Conjunctivitis

Conjunctivitis is an inflammation of the conjunctiva. There are several varieties. Among the most important are, acute conjunctivitis, gonorrhoeal conjunctivitis and granular and membranous conjunctivitis.

The disease varies arcording to severity, course, and prognosis. In mild cases, the disease disappears in a course of a week or two, ordinarily with no complications. In severe forms the disease runs a more protracted course, is resistant to treatment, and corneal and iritis complications are not uncommon. Blindness is a common complication in cases of gonorrhoeal conjunctivitis.

Acute or Catarrhal Conjunctivitis

Etiology—This condition may arise from any one of several causes. It is often associated with infection of the nasopharynx and may follow exanthemata. Irritating atmospheric conditions, direct contaminations from infectious diseases, or micro-organisms such as the pneumococcus, Koch-Weeks bacillus (pink eye), and Morax-Axenfeld bacillus are also important causes.

Symptoms—Hyperemia of the palpebral conjunctiva accompanied by a discharge and excessive irritation of the lids are characteristic symptoms. Infection may be unilateral or bilateral.

Treatment—The local treatment consists of antiseptic drops and boric acid ointment to prevent the lids from adhering. Argyrol 10% or protargol 20 to 25% is frequently prescribed.

The general condition of the patient should be attended to with an examination of teeth, tonsils, and other possible foci of infection.

To isolate the causal organism in the epidemic form of conjunctivitis, a smear of the discharge is taken. Because of the infectious nature of the discharge, individual precautions must be observed. The chronic form of catarrhal conjunctivitis is much the same as in the acute form except that it is more common in adults. The etiliogy and symptoms are also similar but the course is longer. It sometimes terminates in a blepharitis. The treatment is the same as for the acute form.

Gonorrhoeal Conjunctivitis

Gonorrhoeal conjunctivitis is an acute purulent infection of the conjunctiva caused by the gonococcus. It is acquired

directly or indirectly from the gonococcus secretion or through the contact with contaminated linen.

The incubation period varies, but is usually from twelve hours to two or three days.

The chief symptoms are similar to those of gonorrhoeal ophthalmia in the new born, only more severe. The disease is divided into three stages. The first, a stage of infiltration, usually lasts about two or three days. At this time, intense swelling and redness of the lids are evidenced. There is secretion which is at first serious and streaked with blood, and the eye is tender to touch. There is also general malaise, and not infrequently glandular involvement.

In the second stage the discharge is purulent and the process begins to diminish—redness, swelling, and tenderness. This stage is longer and usually lasts about two to three weeks.

In the third, or convalescent stage, the eye returns to normal condition, providing there are no complications. This stage usually lasts for several weeks.

Treatment—Locally the treatment is the same as in ophthalmia neonatorum. Unless the patients are in an especially equipped hospital where all the necessary facilities are available, they should be specialled indefinitely as the nursing care is so vitally important.

Strict individual precautions should be observed, and the equipment, including solutions, bowls, cotton and paper bags for waste, should be kept at the bedside.

The eyes of the examiner must be protected from the pus by wearing spectacles during the treatment; a gown should also be worn. After the treatment, scrub the hands thoroughly to prevent contamination.

As a protection to the unaffected eye when the infection is unilateral, apply a Buller Shield as described in Chapter V. In some clinics a drop of atropin is instilled occasionally. Adults tolerate and require more intensive treatment than infants. In the early stages, irrigations, fifteen minutes to half hourly apart, are necessary to keep the eye free from pus. As the secretion decreases, the treatments may be cut down to every two or three hours. The Buller Shield is removed permanently after three negative smears.

The prognosis is extremely unfavorable in any case, as a large percentage of them have corneal involvement, such as ulceration, leaving a scarred cornea with the consequent impairment of vision, followed by perforation and prolapse of the iris. Occasionally there is a panophthalmitis.

Gonorrhoeal conjunctivitis is a disease reportable to the Board of Health, and requires the follow-up work of the social service department.

Ophthalmia Neonatorum, or purulent conjunctivitis, in the new born is evidenced two or three days after birth. The gonococcus causes 75% of the cases, and 25% are due to other pyogenic organisms, such as the pneumococcus, the staphylococcus, or the streptococcus. The diagnosis is made by a positive smear.

The Mode of Infection in these cases is during parturition as the head passes through the vaginal canal. The organisms which are present in the secretion cover the lids and penetrate into the culdesac as soon as the child opens its eyes.

If the infection manifests itself after the fifth day, it can no longer be associated with birth infection, but from other causes, such as faulty technique on the part of the doctor

or nurse, or from towels and sponges which have come in contact with vaginal discharge.

Symptoms—Usually, on the second day a redness with some swelling of the lids and a little purulent discharge is noticed. These signs become more and more severe on the following day, continuing until about the fourth or fifth day, when the condition reaches its height. At that time there is extreme tenseness of the lids with marked redness and profuse purulent discharge.

Nurses should be extremely cautious about opening the lids, as the pus which is under great pressure may spurt out into the eye of the examiner. Spectacles should be worn during the treatment to prevent this.

The duration of this condition depends largely upon the severity of the disease. Usually in four or five days the process begins to subside, but the average course of uncomplicated cases is from four to six weeks.

Treatment—Ninety-five percent of the treatment in Ophthalmia Neonatorum is dependent upon the nursing care. In severe cases special nurses, both day and night, are necessary. To keep the eyes clean and free of pus which accumulates between the lids so rapidly, fifteen minute to half hourly irrigations may be necessary during the stage of purulent discharge, but as this subsides, the frequency of the irrigations may be decreased to every three hours or so. A more thorough irrigation may be given with a small rubber bulb syringe when the discharge is profuse, but care should be taken that the tip of the syringe is not held near enough to scratch the cornea.

Procedure—Remove the infant to the treatment bed and carefully swathe it in a blanket otherwise a second person

will be necessary to hold the patient. Have all necessary equipment complete. The irrigating solution (boric acid 1:50) should be warm and the rubber syringe sterile. Standing in back of the patient, the nurse turns the patient's head in the direction in which the solution is to flow, to avoid contaminating the other eye if the infection is unilateral. Separate the lids, being careful not to exert pressure on the eyeball. One essential factor in such a treatment is that the finger nails of the nurse be short and free from rough edges.

With the syringe in place, hold a thick pad of cotton or cellucotton at the external canthus to catch the outflow of the solution. Never use gauze or any material of rough texture about the eyes. Turn the head in the opposite direction in treating the other eye and repeat the same procedures.

A thorough irrigation should be given—otherwise if the pus is allowed to remain in contact with the eye it irritates the tissues and soon abrades the corneal epithelium and an ulcer is the result. The development of an ulcer in such cases is regarded in the same manner as a pressure sore in any medical or surgical case and is indicative of poor nursing care.

In conjunction with irrigations, germicidal drugs such as protargol 4 to 15%, argyrol 10 to 20%, or mercurochrome 1% are frequently used. To prevent the lids and lashes from adhering, boric ointment should be applied freely. Atropin is always given with corneal involvement.

When infection is unilateral, infection of the unaffected eye must be prevented, and this is accomplished only by expert nursing care. Some means of restraining the baby's hands will be necessary to keep them away from the eyes.

A swathe or restrainer such as is used at Johns Hopkins may be used effectively. One excellent feature of it is that it allows the infant plenty of freedom to move the lower extremities. Directions for making the restrainer will be given.

Procedure

Equipments (allowances for shrinkage made)

Strip unbleached cotton (26½ x 10)

2 small strips unbleached cotton 7½ x 5

Roll of linen tape.

Fold the material in the center, turn in edges on the other three sides and stitch all around. This completed, the band should be five inches wide; turn and stitch the two smaller strips in the same manner. These are placed on the swathe 9½ inches from each end, and 1½ inches down, and stitched in the center. On each end of the swathe, attach three sets of tapes 10 inches long and 1½ inches apart.

In addition to the restrainer something must be done to prevent the secretions from running over the bridge of the nose into the unaffected eye. The patient may be propped up a little with a small rolled blanket, at the back so that his head is inclined on the side towards the eye affected. Further measures such as an artificial bridge may be used as is described in Chapter VI.

Gradually as the condition clears up, the patient begins to open the eyes. As soon as the discharge disappears entirely, discontinue treatment for twenty-four hours; then take a smear following the same routine until there are three negative reports.

Complications

Corneal ulcerations, followed by perforation and prolapse of the iris, are common and serious complications. These

cases require constant observation for signs of complications which begin with a grayish infiltration at the center of the cornea. The gonococcus and pneumococcus pus has a specific action on the corneal tissues and produces ulcers even without any external abrasion.

Prophylaxis

Ophthalmia Neonatorum is also reportable to the Board of Health. Because of the rigid laws in Massachusetts the use of prophylaxis in the new born is required. Statistics for the last nine years show a marked reduction in blindness due to ophthalmia neonatorum. Crede's prophylactic treatment is most commonly used. This method consists of cleansing the lids thoroughly with 3% boric solution as soon as the head is born. This is followed by the instillation of 1 drop of 2% silver nitrate, or its equivalent. The State Department of Health reports in 1917, 2,325 cases of ophthalmia neonatorum; and in 1926, 1827 cases, a decrease of 498.

Prognosis

The prognosis is good with early treatment providing there are no corneal complications. In contrast to the same infection in adults the prognosis is extremely poor.

Trachoma

Trachoma, another reportable disease, is a chronic form of conjunctivitis of the lids characterized by the formation of follicles or granulations.

The exact cause is unknown. The organism has never been isolated but recent theory claims it to be due to a filterable virus. It is known, however, that it is contagious and is transmitted by the fingers and commonly by contaminated

linen, such as towels, handkerchiefs, etc. It is for this reason that epidemics are liable to break out in institutions or in large families where strict precautions have not been observed. Trachoma is more prevalent among foreigners; a great deal of it is found in Egypt, India, China, and along the Mediterranean ports. It is also found particularly among people who live in congested districts. The symptoms which accompany this disease are both subjective and objective.

Subjectively, the patient complains of photophobia, lacrimation, itching, burning sensation—the eye feeling much the same as it does with a foreign body. The vision is also impaired. It is thought that the acute lacrimating stage is the most infectious.

Upon examination, there is a narrowing of the palpebral fissure, the lids are swollen, the conjunctiva injected, and a muco-purulent discharge is noticed. Everting the lids, the conjunctiva of the tarsus, appears reddened and hypertrophied, with granules or nodules, giving it a rough and irregular appearance.

The nursing care is again most important. Patients should be kept on individual precautions as for any infectious case. Special attention should be paid to the disposal of towels, linen, gauze, and cotton used about patient. Linen should be placed in separate bags and labelled before sending to the laundry, and waste materials contaminated with secretion from the eye should be burned.

Treatment—Locally the treatment consists of daily applications of copper sulphate stick or "Blue-Stone." Sometimes it is used in solution form. Usually three drops of cocaine 4% are given at three minute intervals, just before the treatment, and a drop following, to deaden the pain. This pro-

cedure, however, is not altogether successful, as the treatment is still extremely painful. The discomfort usually lasts for about an hour. The necessity of daily copper treatment makes it more convenient to admit these patients to the hospital unless other arrangements are made for the patient to return daily for treatment.

In very acute stages, daily applications of silver nitrate 1% or 2% may be given, followed by copper as soon as the acute symptoms have subsided. There seem to be diverse opinions concerning the efficacy of hot and cold compresses in the treatment of Trachoma. It has been our experience, however, that the application of heat in very acute stages assists in allaying the pain. When the lids are markedly swollen, iced compresses are frequently given to reduce the swelling. An astringent such as zinc sulphate is also included in the treatment twice daily; this is usually combined with holocaine for pain. Relieve the photophobia with dark glasses and a shade. Atropin is given when there is corneal involvement.

The general treatment must not be neglected as good hygienic living and surroundings play such an important part in treating eye diseases. Plenty of fresh air, rest, sunshine, and a wholesome diet are also essential.

Frequently surgical procedures are necessary, usually in cases which are particularly unresponsive to treatment and in which the granulations have become numerous.

The granulations may be simply expressed by the use of a Knapp Roller Forcep, sometimes only less often, a grattage is done; this consists of scrubbing the lids vigorously with a stiff brush. Both of these operations are extremely painful, and general anesthesia is usually necessary.

Iced compresses should be applied following operation to reduce the trauma and swelling. The most common complications are pannus, corneal ulcers, ptosis of the upper lid, cicatrization, trichiases and occasionally a secondary iritis.

Pannus, which may be classified as a sign as well as a complication, is a superficial vascularization of the cornea, beginning a little above the limbus and superior to the cornea. It may even extend down over the entire cornea if allowed to progress. It is due chiefly to mechanical irritation by the rough upper lid. Of course this reduces the vision markedly and if allowed to progress it will result in a loss of vision to the point of light perception.

Prognosis

The prognosis is distinctly unfavorable as it practically never ends in a complete cure. Relapses are common and treatments must be continued indefinitely.

Dacryocystitis

Dacryocystitis is an inflammation of the lacrimal sac either acute or chronic in form.

Etiology—Dacryocystitis arises usually from an obstruction in the nasolacrimal duct resulting from trauma or oedema in the duct or surrounding tissues. It usually occurs in infancy or in people over 40 years of age.

Signs and Symptoms—Objectively the person has excessive tearing or epiphora, with usually a swelling, sometimes very slight, over the lacrimal sac at the inner canthus. The contents of the sac may be expressed oftentimes by pressure in this region. The chronic irritation from the secretion may cause conjunctivitis to develop. Ectropion (turning out of the lower lid) is often a complication of epiphora.

Chronic Dacryocystitis

Chronic tear sacs are a source of great danger at the time of operations, as a variety of organisms are always present. For this reason, a smear of the conjunctival secretion is always taken preceding cataract extraction.

Treatment—Usually attempts are made to open up the passage by dilating the puncta both upper and lower and passing long silver probes of varying sizes down through the nasal duct into the nose. This is a tedious procedure for the patient and is often rather painful. With a 2 or 3 c.c. Luer syringe and lacrimal needle, the lacrimal sac is irrigated with warm boric or saline until the passage to the nose is unobstructed.

Extirpation of Lacrimal Sac

After non-operative measures have failed with obstinate cases of dacryocystitis, surgical procedures are indicated. A local injection of novocaine and adrenalin is used.

The after treatment consists primarily of keeping the wound clean and free from infection. Sometimes secretion gathers in the eye due to interference in drainage resulting from a blocking up of the nasal duct, by clotted blood and serum following the operation. Wash around the wound with warm boric solution three times a day. Irrigation with the same solution will also help to keep the eye clean and comfortable. Drops of zinc sulphate may be prescribed or some form of antisepsis. Following the irrigation dust the wound with aristol powder three times daily.

Acute Dacryocystitis

Dacryocystitis in this form occurs as an acute exacerbation during the chronic course. It is also known as an abscess of the lacrimal sac.

Symptoms—The symptoms are those of an abscess in the region of the sac. This area becomes swollen, tense, very painful, and red. The red has a peculiar characteristic blue-red tinge commonly associated with lacrimal abscesses. A small yellow spot or "head" appears when the abscess is ready for incision. Incision and drainage is done as soon as fluctuation occurs.

Treatment—The abscess is opened up wide, and thick, yellow-green pus evacuated. A rubber dam or gauze wick is inserted ordinarily to promote complete drainage. Hot boric compresses over the dressing will assist in reducing the inflammation.

After repeated attacks of acute dacryocystitis, an extirpation of the sac is indicated, being done as soon as the acute symptoms subside.

Cataracts

A cataract is an opacity of the crystalline lens or its capsule. It is classified as primary or secondary. Primary cataracts are again divided according to etiology, such as senile, traumatic, congenital, or as a result of a systemic condition such as diabetes, nephritis, etc. The developing process or maturation of the cataract usually covers a period of several weeks or months depending upon the cause. In time primary cataracts (with exceptions of those caused by trauma) involve both eyes, although one is usually in advance of the other.

Etiology—The direct cause of congenital cataracts is unknown, but theoretically it is thought to be caused by intrauterine infections and maldevelopment of the lens. Senile cataracts are thought to be due to old age but the direct cause is unknown. They usually appear sometimes after

the age of fifty. This type of cataract is very common among elderly people. It is sub-classified into four groups according to the stage of development: (1) Incipient—The cataract begins with a greyish infiltration at the periphery of the lens. (2) Immature—The first stage has progressed, and the lens absorbs water, swells, and becomes more opaque. At this stage, the opacity has not reached the anterior capsule of the lens as revealed by the shadow of the iris on the lens. This is done by shining a light near to the eye, at one side. A black shadow is seen on the pupillary margin turned toward the light. (3) Mature—at this stage the lens is absolutely opaque, the light test reveals no shadow on the lens, and the cataract is ready for operation. (4) Hypermature—This occurs when the cataract is permitted to continue indefinitely until the lens shrinks and flattens. Operation in this stage is difficult and the prognosis unfavorable.

Treatment—The only treatment for cataracts is surgery. An extraction of the lens or a needling is done depending upon the age of the patient and the type of cataract. There is absolutely nothing in the nature of drugs which can be used externally or internally to "absorb" cataracts as people are sometimes led to believe.

Anesthesia for Cataract Operation

Ether is contraindicated for cataract operations for several important reasons, the chief one of which is the possibility of serious injury to the eye from post-operative nausea and vomiting, as this usually produces such terrific jarring of the eyes that vitreous is lost, with subsequent loss of vision. Also, the cooperation of the patient which is so necessary

during the operation is impossible under a general anesthesia such as ether.

Treatment—Cataract Extraction

A review of the anatomy and physiology of the normal lens, the pathology of cataract, and the desired results from a lens extraction are suggested in order that the student may understand the rules governing the nursing care. (Chapter I, under Refractive Media).

The operation as it is done in adult life differs in character from that which is done in childhood, and for that reason each will be described separately.

There are several types of cataract extractions in use, but in the majority of cases the combined extraction (with iridectomy), which will be described, seems to be preferred.

The steps are as follows: The patient already cocainized, is draped with sterile goods by the doctor and the operation is begun.

A small conjunctival flap is dissected downwards towards the limbus, and a double-armed conjunctival-scleral suture is inserted, so arranged as to be out of the way of the incision. The function of this suture is in case of necessity it may be pulled up quickly, thereby closing the wound, to prevent the escape of vitreous, to give better proximation of the wound, to prevent prolapse of the iris, and to lessen the possibilities of infection during convalescence. With a cataract knife, an incision is made at the limbus, slightly into the corneal tissue. Next, the iridectomy is done, with iris forceps and scissors. With a cystotome or toothed capsule forceps, the anterior capsule of the lens is ruptured. With the aid of pressure below, and counter pressure above, the lens nucleus is slowly expressed. The suture is tied then,

and the anterior chamber is irrigated with warm normal salt, until as much material has been removed as possible. The pillars of the iris are then reposited, with iris repositors, the wound soothed, atropin ointment is put into both eyes, and a double eye bandage is applied.

Adults—Post-Operative Care

Probably few people realize the importance of the post-operative care of a cataract patient, and unless a nurse has had special training in the care of eye cases, she is thoroughly incompetent to assume the responsibility of the nursing care of such a case.

Rules which will be outlined for the post-operative nursing care for cataract patients are merely general rules which may be modified and changed according to the physician in charge.

The patient is placed in a "cataract bed" and then wheeled into the operating room. After the operation, the bed is wheeled out to the ward where the patient remains with both eyes bandaged until the fourth day after operation. The use of the cataract bed avoids transferring the patient from the stretcher to the bed. In some hospitals, of course, they are moved in this manner, but it is a dangerous procedure, especially when the transfer is made by orderlies or attendants. The danger lies in moving the head when transferring the patient from the stretcher to the bed.

If the patient has not been instructed before the operation as to what his behavior should be the first few hours thereafter, he should be told by the head nurse as soon as he returns from the operating room. It is believed that better results may be obtained in this way as a result of the co-operation and confidence of the patient. Among the im-

portant things about which he should be told is the necessity of complete quiet and rest flat on the back for four to six hours following the operation. Patients should be cautioned about the dangers of injury to the eye from a blow which might easily result from an attempt to pull the bedclothes over the shoulders. Warn them not to cough unless it is absolutely unavoidable. Sudden jerking of the head may open up the wound. If the patient becomes nauseated and is compelled to vomit, instruct him to do so with as little straining as possible.

Squeezing the eyes together tightly is also injurious. Cataract patients should not be allowed to wait upon themselves in any way, even to reach for articles on the bedside table, hence, a bell should be placed conveniently for them to use whenever necessary. Three or four hours after operation the wound has healed sufficiently to enable the patient to be turned on the opposite side from the operated eye so that the back may be rubbed. This simple procedure will add greatly to the comfort of the patient. Allow him to remain in this position for an hour or more, propped by a pillow at the back. A thin pillow placed at the small of the back will usually relieve back strain.

Whenever possible the Gatch bed should be used for the first four days after operation, or until the patient is gotten out of bed. The position of the patient can be changed more easily on these beds. By elevating the head of the bed about an angle of forty-five degrees, and at the knees, a comfortable position is easily maintained.

As a means of protection to the operated eye, it is usually wise to put on a Ring mask over the double bandage immediately after the patient returns from the operating room.

As long as the patient is in the hospital this mask is worn every night, even after both eyes have been unbandaged. In the day time it may be removed and tied on the bed in readiness for the night.

Other protections are used such as the water glass helmet which covers the head and extends down over both eyes. This offers much support to the wound in the absence of a conjunctival suture. In some institutions this suture is never used. Occasionally the mask and other protections are dispensed with entirely. If this is done, a bandage is tied securely around both wrists and is fastened to the iron bars at the foot of the bed. This allows the patient enough freedom to move his hands and arms in all directions except towards the eyes. Likewise the hands are tied every night as long as the patient remains in the hospital.

Special attention should be given to bandages and dressing to keep them in place. The tie should be fastened lightly without causing pressure over the eye. A bit of adhesive fastened to the tie and to the forehead will prevent the dressing from slipping.

Twenty-four hours after operation the wound has healed firmly enough so that the patient can be seated on a low back rest; the head should be kept as quietly as possible. Making the patient generally comfortable by rubbing the back and placing soft pillows under the knees and elbows helps him to endure the strain of lying so quietly in one position. Special attention should be given to the buttocks and elbows when the patient is turned to avoid skin irritation.

Diet—The diet of the post-operative cataract patient for the first twenty-four hours should be liquids without milk, black tea or coffee. Clear broth and dry toast may also be

given occasionally, but unless the patient has a special nurse this is not advisable.

The following day the patient may be allowed a light diet consisting of vegetables, milk, or other soft food.

Occasionally following operation the mental faculties of certain patients become affected. This usually occurs in senile or debilitated patients. It is a temporary condition which passes in a short time and oftentimes is helped by merely uncovering the unoperated eye or by giving a low back rest. Seldom are radical measures necessary, although in violent cases some means of restraint may be needed in order to protect the eye. It is advisable, however, to put special nurses on these cases until the mental condition subsides. The same is true with foreign patients who do not understand English. In these cases, a nurse who speaks the same language as the patient should be secured if possible.

If the patient complains of gastric distress, pain or flatulence, a hot water bottle lightly filled applied to the abdomen may relieve the condition. To prevent hot water bottle burns it must be protected by a cover and the temperature should not exceed 125 degrees F. If this does not relieve, a rectal tube should be inserted until the patient obtains relief.

At the first indication of nausea give a dram of Dr. Derby's nausea mixture containing the following ingredients:

Sodium Phenol-sulphonate, drams 2
Tinctured Ginger, drams 1½
Syrup Ginger, ounce 1
Peppermint Water, ounces 4.

A dram every two or three hours will ordinarily settle the stomach and prevent an attack of vomiting. Report any signs of coughing so that the doctor may order codeine.

Removal of Bandages

About the fourth or fifth day after operation the well eye is unbandaged and the patient is allowed out of bed one half a day. Lavatory privileges may be granted providing the distance to walk is not far. On the fourth day after operation the eye is examined and dressed by the doctor under sterile procedures.

Not until the fifth day should the hair be combed, and then with great care not to move the head about unnecessarily.

On the eighth day, both eyes may be unbandaged. The patient is given dark glasses and a shade to wear as a protection to the eyes from the light.

As a rule, cataract treatments are not done by the nurses until after the eighth day, when a bandage is no longer necessary. Many cases do not require treatment after that time.

The danger of infection and injury during the treatment is great. Hence the necessity of perfect technique, and the dangers of careless work cannot be emphasized too much. In manipulating the lids, for instance, preparatory to putting in the drops, avoid making the slightest pressure on the eye. Do not touch the lids any more than is necessary. As the drops are put in they should not be allowed to fall on the cornea carelessly or forcefully. This may be avoided by holding the dropper nearer to the cornea. If ointment is used, put it in between the lids as well as possible without attempting to pull down the upper lid over the lower as

described in Chapter IV. This is a dangerous procedure following cataract extraction.

Hemorrhage following cataract extraction is usually manifested by sudden, intense pain, and the appearance of blood in the anterior chamber. Any of these signs should be reported to the doctor at once. Among other things, report to the doctor when the patient removes the black mask at night, in case any injury has occurred to the eye. If the patient falls out of bed or in any way should suddenly strike the eye, it should be reported at once.

Discission

A discission or needling is an operation which is done chiefly in childhood for a cataractous condition of the lens. The nucleus in childhood of course is undeveloped, and the lens, therefore, cannot be extracted as it is in adults. Discission is also done to break up the after cataract which sometimes remains following cataract extraction.

A general anesthetic is always necessary for children. By introducing a long slender knife-needle, the capsule of the lens is cut, and by rotary motion of the needle the lens substance is broken up. Usually this substance is absorbed, although several operations may be necessary. It is sometimes a difficult task to convince the parents of this necessity.

Atropin 1% is usually prescribed to dilate the pupil. The eye is bandaged for at least 48 hours. This constitutes the chief treatment following discission.

It is well to restrain the arms and hands of infants and small children by the use of cuffs, otherwise the bandages will be torn off and the eye may be injured. Directions for making cuffs will be outlined in Chapter VIII.

Children should be watched for reactions rather carefully when any form of atropin is used in the treatment. They are usually more susceptible to atropin and its derivatives than are adults. Weak solutions of atropin or homatropin are used most commonly. Pressure should be made on the puncta for at least a full minute after the use of atropin. This must be done with extreme care after the operation.

Iridectomies and Trephines

Both of these operations are done primarily in the treatment of glaucoma as a means of relieving the intraocular tension. Usually this opening is made in the central superior portion of the iris, i. e., at twelve o'clock. The effect of the operation is usually temporary, and a repetition is sometimes necessary before satisfactory drainage is obtained.

A trephine is a small opening made at the sclerocorneal junction. The conjunctiva is dissected back and the opening is made with a trephining instrument. The conjunctiva is replaced over the opening. Through this the aqueous drains out continuously under the conjunctiva. Cocaine combined with pilocarpine is the local anesthetic used.

Preceding these operations a smear and culture of the conjunctival sac should be made.

Post-Operative Care

The post-operative care of the patient consists mainly of making him generally comfortable. The wound is usually taken care of by the doctor for the first few days following the operation. Through this period the danger of infection is great. This is particularly true after a trephine, as the conjunctiva is very thin and penetrable. For pain following operation give aspirin grs. 10 every four hours. If the pain

is extreme, morphine grs. 1/6 subcutaneously may be ordered.

There are various modifications of these operations, each claiming some particular merit, but the preparation of the patient and the post-operative care is the same.

Note: Clock Notation

Comparing the cornea with the clock, a point on the superior central border of the cornea would be at twelve o'clock, while a point diametrically opposite would be at six o'clock. This notation is particularly helpful in describing the location of foreign bodies on the cornea.

Squint

Squint or strabismus is a condition in which one of the eyes deviates from its proper direction so that the visual axis fails to meet on the point of fixation. The patient may complain of diplopia, or double vision, in the early stages.

Squint may result from an inherent deficiency of either the vision of one eye (congenital) or of the neurological mechanism of coordination which through the twelve extrinsic muscles controls the movement of the two eyes.

Squint may also result from trauma affecting either the extrinsic muscles or their nerve innervation. Systemic conditions or diseases may affect directly or liberate toxins which affect the motor centers of the pyramidal tracts.

According to the direction of deviation, squint may be divided into: convergent, divergent, mixed and vertical. Squint also may be classified as constant, intermittent, and alternating.

Etiology—The etiology of squint although much disputed is thought to be due to some disturbance or irregularity of

the power of accommodation or divergence (Deesch). Inequality of vision of the two eyes may be a contributing factor.

Frequently in the first few years of childhood, squint may be noticed periodically. These children should be examined at once so that glasses may be prescribed. If glasses are prescribed they must be worn constantly.

If non-operative measures (glasses, muscle exercises, etc.), are not successful after at least six months' trial, surgical interference is indicated. The age of operation varies, depending on the operator, but it is usually performed somewhere near the school age, five to seven years. An advancement of the external rectus, or a tenotomy of the internal rectus, are operations used.

Post-Operative Care

The first consideration in the nursing procedures of these cases is keeping the eyes as clean as possible by frequent irrigations of warm boric solution. If secretion is allowed to accumulate, the lids and lashes adhere. To prevent this, following the irrigation use boric ointment freely between the lids.

Sterile solution and ointment should be used for the first few days after operation. Bandages may be removed around the third or fourth day, and local or general anesthesia may be given.

Glaucoma

Glaucoma is a disease of the eye characterized by increased intraocular pressure. It is classified as primary and secondary. The primary is divided into acute congestive, subacute, and chronic simple. Buphthalmos, or juvenile glau-

coma, is another form, usually congenital, occurring in infancy.

1. Primary Glaucoma

Primary glaucoma is a disease of middle life. It is of great importance as it is responsible for 30% of all blindness after forty years of age.

The direct cause is unknown, but extreme fatigue, worry, and emotional strain are predisposing factors. These factors no doubt act only as immediate causes, merely aggravating a condition already existent. It is known, however, that the filtering angle which carries aqueous humor from the eye becomes blocked. The mildness of the symptoms in many cases prevents the patient from realizing the seriousness of the situation. In this way the chronic, simple glaucoma may progress quite far with irreparable damage to the vision before the patient seeks the advice of a specialist.

The vision becomes impaired by the increased pressure against the delicate nerve fibres at the optic nerve head or blind spot, causing them to atrophy. As the condition progresses, the blind spot enlarges with a subsequent decrease in the field of vision (Saving Eyesight After Mid-Life—Waite).

a. Acute Glaucoma

The characteristic symptoms are terrific pain, impaired vision, and sometimes the patient may see colored rings around lights. Objectively, the eye shows extreme congestion of a deep variety. The cornea looks steamy, the anterior chamber shallow, and the pupil dilated, immobile, and oval in shape. On palpation the eye feels harder. Normal tension with the Schiötz tonometer is about 12 to 25 milli-

meters of mercury. Tensions above the 25 m.m. are looked upon as suspicious and should be given a careful examination.

Ophthalmoscopic examination is not satisfactory during an acute attack because of the hazy cornea. The duration of the attacks vary, but last usually from several hours to several days.

Treatment—The chief treatment of this condition is, of course, to reduce the tension by the use of myotics, pilocarpine, or eserine—or by surgical procedures. Dionine and hot fomentations are frequently prescribed for pain, but in extreme cases morphine may be necessary.

b. Subacute Glaucoma

The subacute congestive type differs from simple glaucoma only in the severity of the attack. With it the symptoms are less marked than with the simple type. The etiology and treatment are also the same.

Chronic Simple

Perhaps the most baffling type of glaucoma is the chronic simple because the early findings, subjective as well as objective, may attract little attention. From time to time the patient has attacks of blurring vision lasting from a few minutes to an hour. This is accompanied by slight headache and the patient may see rings or halos around lights.

Treatment—The treatment is usually surgical, although usually not until medical treatment has been tried first.

Prognosis—The prognosis for vision is fair if early treatment is instituted.

2. Secondary Glaucoma

Secondary glaucoma is characterized by an increased ten-

sion in the eye following inflammatory conditions such as iritis or uveitis.

Treatment—By treating the cause the tension usually decreases. If this is not successful, surgical procedures are necessary.

Nursing Procedures—Some knowledge of the symptoms and treatment of glaucoma is absolutely necessary before intelligent care can be given to these patients. Students should understand the danger of confusing glaucoma with acute iritis and how the treatment differs. It should be remembered that atropin is used in the treatment of iritis, and that pilocarpine is used for glaucoma; the pupil in iritis should be dilated and, on the contrary, in glaucoma it should be contracted and never dilated. The pupils must be watched carefully, and any undesired reaction must be reported to the doctor.

If by mistake a drop of atropin were to be instilled into the glaucomatous eye, an acute reaction might follow with such serious consequences that the sight of the eye might be entirely lost and enucleation the outcome. In the Massachusetts Eye and Ear Infirmary a red disc is hung on the bed of the glaucoma patients as a reminder that precautions must be observed in doing the treatment—and that atropin must be kept as far away as possible from their eyes.

Glaucoma Treatments

The "pilocarpine tray" is used for these treatments. It consists of a large tray on which has been arranged the necessary equipment—five solution bowls, black and white droppers, pilocarpine, and eserine. There should be a bowl of corrosive solution 1-1000 and one containing warm boric 1-50 for the finger tips. This tray is taken to the bed of the

patient where the treatment is done. Protect the bed with a blanket and place the patient in a dorsal position for the treatment.

It is very important that the hands be thoroughly washed before these patients are touched. This is necessary since atropin may be carried so easily on the finger tips and might in this manner get into the glaucomatous eye.

Occasionally there are cases of glaucoma in one eye, and iritis in the other. Do the pilocarpine treatment for the glaucomatous eye first, following with the atropin treatment for the iritis. To prevent atropin from being carried into the glaucomatous eye, these patients should be cautioned not to rub their eyes.

3. Buphthalmos (Juvenile Glaucoma)

This type of glaucoma is evidenced in infancy and is thought to result from a defective development of the canal of Schlemm.

Symptoms—Because of the yielding character of the sclera and surrounding tissues in childhood, the chief symptom is an extreme enlargement of the eyeball. The tension increases, the pupil becomes widely dilated and the anterior chamber very deep. Ophthalmoscopic examination reveals a moderately excavated disc.

Prognosis—The progress of the disease is slow and the prognosis nil.

Treatment—Non-operative treatment is tried first by using myotics, but surgical procedures are nearly always necessary. Usually a trephine is done.

Iritis, or inflammation of the iris, may be either primary or secondary. Secondary iritis follows any previous in-

flammation of the eye and in its most acute form may be mistaken for acute glaucoma.

Etiology—The chief causes of primary iritis in order of their importance are: Lues 60%, tuberculosis, gonorrhoea (all three causing about 80%), focal infections, 10 to 15%, and diabetes about 5 to 10%.

Symptoms—Subjective: Intense pain in the eye and forehead, more severe at night, accompanied by photophobia and lacrimation.

Objective—Mixed injection (ciliary and conjunctival), turbid aqueous, discolored iris, small irregular pupil, sluggish in reaction. In severe cases there may be deposits of fibrin in the anterior chamber.

Complications—Because of the prolonged course of the disease and the anatomical relationships within the eye, complications in iritis are common. Perhaps the most common one is the formation of synechiae (adhesions), anterior and posterior. In this condition the iris adheres to the cornea (anterior synechiae) or to the anterior capsule of the lens (posterior synechiae). The latter form is by far the more common. This is due to exudate and fibrin given off by the congested iris, which cause the lens and edges of the pupil to stick together. Deposits of pigment on the lens also are derived from the same source. Once the pupil is bound down completely, a condition develops known as "blocked pupil." This condition causes a backing up of the aqueous humor with a subsequent bulging of the iris, which is known as iris bombé. With this the tension increases, and secondary glaucoma results.

The prognosis of acute iritis is favorable with early treatment.

Treatment—A thorough investigation of the cause should be made and treatment local or systemic instituted accordingly. The patient is more comfortable and better off in bed, especially if the condition is accompanied by increase in temperature. The diet should be simple and nourishing. If the iritis is of luetic origin, anti-specific treatment should be instituted.

Locally the pupil should be dilated to the maximum with 1% atropin sulphate solution or ointment, and even higher percentages may be necessary. Dark glasses will relieve the photophobia. For the pain, hot compresses and dionine 10% three times daily are used effectively. In some forms of iritis salycilates are prescribed. If synechiae are present, strong solutions of atropin are used. Subconjunctival injections of adrenalin 1-1000, 5-7 minims are given occasionally to break them up.

If the iritis is complicated by secondary glaucoma, other procedures may be used. Surgery, such as an iridectomy, in old conditions, may be indicated. In contrast, if the process is active, and the tension not too high, every attempt is made to dilate the pupil, disregarding the tension temporarily.

Keratitis

Keratitis, or inflammation of the cornea, is classified into two groups,—systemic or trophic and traumatic. Traumatic keratitis includes inflammation resulting from injuries, foreign bodies, burns, irritations from conjunctival injection, and misplaced cilia.

Corneal Ulcers

Corneal ulcers may develop following foreign body removal or any injury of the cornea wherein the epithelium

is abraded. The causal organisms are the pneumococci, staphylococci, etc.

Pneumococcus Ulcer

One of the most virulent types of corneal ulcer is the pneumococcus or hypopyon ulcer. The ulceration not only spreads over a wide area but penetrates deeply into the corneal substance.

Etiology—As the name implies the causal organism is the pneumococcus.

Symptoms—The ulcerative process begins with a greyish infiltration on the center of the cornea just below the pupillary opening. It spreads rapidly in a crescent shaped course, and there is marked ciliary and conjunctival injection, photophobia, blepharospasm and intense pain. Usually iritis develops with pus formation in the anterior chamber (hypopyon).

Treatment—The constitutional treatment is of great importance, since the occurrence is chiefly among people having lowered resistance as a result of poor physical condition. Improve the general health by proper diet and hygienic living conditions. Special attention should be given to diseased tonsils, adenoids, teeth and other foci of infection.

Locally dilate the pupil. To relieve the pain give holocaine or dionine and dark glasses for the photophobia. Optochin (ethyl-hydrocuprein), a drug which is thought to act more or less specifically on the pneumococcus, is often used in the treatment of pneumococcus ulcers. Electric cautery is frequently necessary to prevent the ulcer from spreading.

To prevent complications such as perforation and prolapse of the iris a paracentesis is done. This evacuates the

contents of the ulcer gradually and avoids the danger of spontaneous rupture. Before the ulcer heals entirely a repetition of this procedure may be necessary. At the first indication of perforation a pressure bandage should be applied.

Prognosis—From all angles the prognosis of pneumococcus ulcers is extremely poor. The vision is always greatly impaired by the formation of scar tissue.

Phlyctenular keratitis is a condition of the cornea characterized by the formation of nodules or phlyctenules on the cornea, near the limbus. They may occur also on the conjunctiva. Those nodules are superficial usually and are composed of collections of lymphoid cells.

Etiology—A large percentage of these cases is due to a tubercular lesion somewhere in the body. The occurrence is usually in malnourished children between the ages of 2 to 15 years living in unhygienic surroundings. Diseased adenoids and general instability are also predisposing causes.

Symptoms—Photophobia, blepharitis, lacrimation, pain, ciliary or conjunctival injection (depending upon severity), and phlyctenules occurring in groups or singularly, outline the characteristic signs and symptoms of the disease.

Treatment—The constitutional treatment for this condition is extremely important. The patient should have a complete physical examination, and a thorough search should be made for any foci of infection. Treat the cause and improve the living conditions if possible. The diet of course should consist of simple nourishing foods, cutting down carbohydrates to the minimum. Candy and pastries should be eliminated entirely, and cod liver oil should be given three times daily to help build up the patient's general condition.

Locally, atropin can be used to dilate the pupil and to

lessen the danger of involving the underlying structures. For the pain, dionine or holocaine are useful. Photophobia and blepharitis are marked, which may be relieved by dark glasses or shades. Hot fomentations will often help to relieve the congestion and give the patient a certain amount of comfort.

Prognosis—The prognosis is generally favorable although recurrences are common. The phlyctenules usually heal without scarring although in severe cases corneal opacities may remain. These may interfere with the vision if they are in the region of the pupil.

Interstitial Keratitis

Interstitial keratitis is a disease of the cornea, involving its middle layer or stroma. It is due to congenital Lues and manifests itself between the ages of 5 and 15—rarely much older.

Symptoms—The characteristic signs and symptoms are photophobia, lacrimation, blepharitis, pain, disturbed vision, mixed injection, steamy cornea (ground glass appearance), and occasionally a "salmon patch." This is a collection of deep seated blood vessels which gather on some part of the cornea. There are usually other external manifestations of lues, such as Hutchinson teeth and a saddle back nose.

Treatment—The pupil should be dilated to the maximum with atropin. Hot foments will hasten absorption, and dionine or holocaine are usually prescribed for the pain.

Anti-specific treatment is usually considered beneficial in conjunction with the local treatment although there is some diversity of opinion concerning this. Special attention should be given to the diet and hygiene of the patient with emphasis on plenty of fresh air and sunshine.

Prognosis—Patients with this disease are reported to the Social Service as "follow-up" cases. This usually means that the patient's entire family is often under observation and treatment for the luetic condition.

Iritis

Iritis, or inflammation of the iris may be classified into primary and secondary iritis. It is one of the most serious and consequently important eye diseases. In primary iritis the infection manifests itself primarily in the iris in contrast to secondary iritis, where the disease follows inflammation from neighboring parts.

Etiology—Lues, tuberculosis, gonorrhoea, diabetes, trauma, and systemic infections are common causes. It may be of idiopathic origin also.

Signs and Symptoms

The eye has a red, and angry appearance, and there is mixed injection. The iris appears dull, irregular in its markings and swollen. The pupil is irregular, sluggish in its reaction or immobile, and contracted. There may be exudate in the anterior chamber and synechiae or adhesions binding down the pupil. The aqueous may be turbid and the cornea cloudy. Subjectively, there is intense pain (worse at night) photophobia, lacrimation and impaired vision. The patient suffers from general malaise and frequently is forced to go to bed.

Complications

Complications of iritis which may involve the surrounding structures to a great extent prolong the course of the disease.

The formation of posterior synechiae is a common com-

plication, and the pupil may be entirely bound down or occluded. Secondary glaucoma, uveitis and iris bombé are other complications.

Treatment—Systemically treat the cause. Put patient to bed, force fluids with special attention to elimination. With an elevation of temperature give a light diet. Treat the photophobia with dark glasses and a shade. Large doses of salicylates with sodium bicarbonate or aspirin are usually effective in quieting the pain, although codeine or even morphine may be necessary.

Continuous maximum dilation of the pupil is necessary to prevent the formation of adhesions or synechiae. Atropin 1% is usually used. Stronger percentages are necessary to break them up if adhesions are present. Occasionally adrenalin injections under the conjunctiva are necessary before the adhesions are fully broken up.

Dionine or holocaine and hot fomentations may be given to diminish the pain. If the tension continues, a paracentesis or iridectomy may be necessary for its relief.

Prognosis—The prognosis depends upon the severity of the disease. It is, however, a much debated question. With mercury treatment, recoveries have been reported in a year to eighteen months. Some authorities believe that cases clear up with mercury and salversan in six months. The vision is usually impaired however, because of corneal opacities.

Cyclitis

Cyclitis or inflammation of the ciliary body is a condition which is commonly associated with iritis. It occurs usually as a complication.

The etiology and treatment are the same as for iritis.

Symptoms—In addition to those of iritis, ciliary tenderness and descemetitis characterize cyclitis.

Prognosis—The prognosis of cyclitis is not favorable because of sequelae. It usually terminates as uveitis and the involvement of the entire uveal tract.

Choroiditis

Choroiditis, or inflammation of the choroid, may be divided into two groups, suppurative and non-suppurative or exudate.

Etiology—The common causes of the suppurative type are ectogenous infections such as perforating wound, corneal ulcers, or of metastatic origin.

The exudate type is usually due to some systemic disturbance as lues, diabetes, myopia or infected sinuses.

Symptoms: *Suppurative*—The vision is impaired. The patient sees flashes of light before the eyes, and floating opacities cause distortion of objects. There is no pain unless the condition is accompanied by iritis, and most of the signs are seen only with the ophthalmoscope. The fundus reveals patches of exudate white or yellow. These atrophy finally and become surrounded with pigment. The field of vision is often defective.

Non-Suppurative—All the above symptoms are present, including those of the systemic cause.

Treatment—(Suppurative)—Palliative treatment is about all that can be done for these patients. For the pain give hot compresses. After the eye quiets down, an enucleation is indicated.

Non-Suppurative—The treatment here depends upon the cause. Save the eyes as much as possible and give dark

glasses for the photophobia. Special attention to general health is important in any form of choroiditis.

Prognosis—In any case the prognosis is grave, although the position of the exudate patches play an important part. Sometimes the macula region remains free until the end stages.

Uveitis

Uveitis is sometimes classified as chronic cyclitis. The iris, ciliary body, and choroid are involved.

Etiology—Injury is a common cause, though constitutional diseases such as gonorrhoea, lues, diabetes, exanthemata, and focal infection are important causes.

Symptoms—A diminution of vision may be an early manifestation, and there is usually pain and photophobia. The tension frequently goes up and the pupil becomes dilated. Ciliary injection may be present, and in severe cases membranes form in the anterior chamber from exudate given off by the iris. This sometimes causes serious complications, secondary glaucoma and general atrophy of the eyeball being among the important.

Treatment—First, the cause should be removed if possible, and anti-specific treatment instituted if necessary. Locally the treatment is that of acute iritis. If the condition does not subside with non-operative treatment, surgery is then indicated to reduce the tension and free the anterior chamber of the exudate.

Prognosis—The prognosis is always poor as the condition in severe forms progresses to a purulent stage or even to panophthalmitis.

Sympathetic Ophthalmia

Sympathetic Ophthalmia, or sympathetic uveitis, is an in-

flammation of the uveal tract in one eye following a perforating injury to the other eye.

Etiology—Just how the infection takes place in the sympathizing eye is not definitely known, but, it usually follows injury to the ciliary body or injuries in that region. Children or young adults are especially subject to this condition.

Signs and Symptoms—Usually from a few weeks to several months elapse before the sympathizing eye shows signs of involvement—the time varies. The first indications are the usual irritative symptoms, lacrimation and photophobia. The patient may complain of a feeling of a foreign body in the eye. Soon the vision begins to diminish due to deposits on Descemet's membrane. There is ciliary injection and severe pain. Adhesions may develop and the pupil often becomes occluded with a subsequent rise in tension. Membranes form in the vitreous from the cyclitis, and finally the eyeball becomes atrophic.

Treatment—Following iridocyclitis in the injured eye, prophylactic treatment of the sympathizing eye is of the greatest importance. Diligent treatment of the exciting eye and careful observation for signs of irritation of the other is most essential. If the injured eye is blinded, an immediate enucleation must be done. Providing the vision is not entirely gone, the question of such an operation is a difficult one to decide. With the patient under close observation, the operation may be delayed if the injured eye remains quiet and no indications of irritation in the sympathizing eye are manifested.

The sympathetic ophthalmia itself is treated according to the rules of iridocyclitis—hot compresses, dionine, atropin

(sometimes alternated with pilocarpine), and dark glasses. Large doses of mercury and sodium salycilate are effective.

Prognosis—Unfortunately, mild cases of sympathetic ophthalmia are rare; hence, the prognosis is extremely poor, most cases ending in blindness.

Panophthalmitis

Panophthalmitis is a purulent inflammation of the interior of the eye, characterized by pus formation and protrusion of the eyeball.

Etiology—Most of the cases of panophthalmitis are caused by penetrating injuries or by sources within the body itself.

Signs and Symptoms—The lids are markedly swollen and tense. There is intense pain, temperature, and general malaise, nausea, and vomiting. The vision rapidly diminishes with a cloudiness of the cornea, and there is mixed injection. The tension increases as the aqueous and anterior chamber become filled with exudate. The eyeball protrudes until the pus breaks through the sclera. After operation the pain subsides, the tension decreases, and a shrunken eyeball or phthisis bulbi is left. The entire process covers a period of several weeks, usually six to eight.

Treatment—Until the acute stage subsides, an enucleation is considered unwise. The pain may be relieved by the application of heat and by narcotics.. Sometimes the sclera may be incised to evacuate the pus.

Prognosis—The prognosis is invariably unfavorable, usually ending in blindness of the infected eye.

Retinitis

Retinitis, or inflammation of the retina, is classified according to the etiology. Among the most common types

are albuminuric diabetic, luetic, hemorrhagic, simple, and deep.

Etiology—Retinitis is most frequently due to a constitutional disease such as leukemia, arteriosclerosis, or as a complication of iritis or choroiditis, and both eyes are usually involved.

Symptoms—In each type there are no external signs, but the patient first complains of a diminution in vision, a distortion of objects before the eye. There is a slight sense of discomfort but no real pain. The ophthalmoscopic examination reveals spots on the fundus arranged in a variety of patterns depending upon the type. For example, spots which form a star-shaped pattern surrounding the disc characterize albuminuric retinitis. Irregular small white spots irregularly arranged characterize diabetic retinitis.

Treatment—The treatment consists primarily of treating the cause. Put the eyes absolutely at rest by the use of atropin. Everything should be done to promote diaphoresis, with the bowels well open. Iodides may be prescribed.

Prognosis—The prognosis depends upon the cause and early treatment.

Detached Retina

As the name implies the retina becomes detached or pulled away from its adjacent choroid. The cause may be injury, myopia, iridocyclitis, choroiditis, or choroidal tumors.

Symptoms—The chief symptom is loss of vision on the side opposite from the detachment. The central vision remains good for a while until the detached retina drops in the line of the pupillary opening, when of course the vision is markedly impaired.

Treatment—Treatment is not generally beneficial, as the condition is progressive and relapses are frequent.

About the only thing which can be done is to give the patient absolute rest in bed, perfectly flat on the back. Both eyes should be bandaged. Surgery is sometimes attempted, a scleral puncture or trephining the sclera over the point of detachment. This, however, is done without great success, and permanent cures of this condition are exceedingly rare.

The nursing care is important. The head should be immobilized with hard pillows or sand bags; the patient must not be permitted to move it. The body may be turned, but the head should remain absolutely still. As the course of the disease is protracted, great strain is put upon the back. This requires frequent massage to prevent skin irritation, but it must be done with the utmost care and without moving the head. Keep the bed linen tight and free from crumbs.

Prognosis—The prognosis is exceedingly poor.

Tumors

Sarcoma of the Choroid

Sarcoma of the choroid is one of the most important of intraocular tumors. It is malignant and occurs chiefly in adults between the ages of 40 to 60.

Symptoms—It begins with a small rounded mass springing from the choroid which pushes the retina forward. Only one eye is involved ordinarily.

The development of the tumor may be divided into three or four stages. First, a quiet stage when the tumor is barely visible with the ophthalmoscope. The vision is usually defective at this time on the side opposite the lesion. Secondly, there is pain in this stage with rise in tension and

subsequent development of glaucoma. Third, or extra-ocular, stage, the tumor protrudes through the eyeball. The fourth stage is characterized by the occurrence of metastasis in the blood stream, most commonly in the liver.

Treatment—An enucleation should be done as soon as the diagnosis is made, or an exenteration in the final stage. X-Ray and radium may be effective in the attempt to prevent metastasis.

Prognosis—In the early stages of a sarcoma 20 to 30% of cases may be cured, but the prognosis for vision or for life if early treatment is neglected is grave.

Glioma

Glioma of the retina is also a malignant growth. It develops from the granular layers of the retina and occurs in children usually under five years of age. One eye is ordinarily involved, occasionally both.

Symptoms—This is also described in three stages similar to sarcoma of the choroid. Diagnosis in the early stage is made with the ophthalmoscope. The only subjective symptom, if any, is a diminution in vision. Parents are usually the first to notice it as the child goes about or is at play.

Later a mass having a metallic lustre appears in the pupillary opening. This gives a "cat's eye" appearance and it is usually in this stage that the patient is taken to the doctor for diagnosis.

Treatment—Because of the danger of recurrence, an immediate enucleation or exenteration is necessary, depending upon the extent of the tumor. The process continues and extends back through the globe around the optic nerve and finally reaches the brain. Unless a radical operation is done, death occurs within a few years.

Enucleation

Indications for an enucleation are:

1. For the prevention of sympathetic ophthalmia (following injury to one eye involving the ciliary region).
2. In cases of:
   - Absolute glaucoma
   - Phthisis bulbi
   - Malignant tumors
   - Painful blind eye.

Post-Operative Care

The chief complication following enucleation is hemorrhage and for this reason the patient should be watched carefully. Any signs of staining on the bandage should be outlined with ink and an increase in area should be reported to the doctor. The patient may experience discomfort from the pressure bandage but this should not be loosened or tampered with without permission from the doctor. In normal cases it is removed, as a rule, in about 48 hours. Morphine or codeine may be necessary if the pain becomes too intense.

Several weeks after operation the patient is usually fitted to a glass eye. The care of the socket and eye will be discussed at length in Chapter XI.

CHAPTER VII

PREPARATION OF PATIENT FOR EYE OPERATIONS—POST-OPERATIVE CARE—GENERAL RULES—REMOVAL OF FOREIGN BODIES—SUTURES.

General preparation (local anesthesia).

Much of the eye operating is done under local anesthesia, consequently the general preparation is very simple. During the night preceding operation, fluid can be given ad lib and sometimes veronal grains 10 in hot milk is prescribed to insure the patient of a good night's rest. For breakfast give coffee, cereal, and toast.

Hypodermics or morphine or atropin are not usually necessary.

Ether Preparation

When the operation is done under ether anesthesia, the general preparation is much the same as for any operation. The usual routine is as follows: ether breakfast consisting of black coffee; soap suds enema, and a specimen of urine sent to the laboratory for examination.

Local Preparation

The first step in the local preparation is the clipping of the eyelashes, or cilia, with a pair of curved point scissors, directing the blades away from the eyeball. This is done on

all cases unless ordered to the contrary when the operation is to be upon the eyeball. The reason for this is that the hair (which cannot be sterilized) would contaminate the instruments and the field of operation. Also with the light shining from above long lashes would cast a shadow on the field of operation. In the absence of the lashes the post-operative care of eye cases is simplified.

Equipment—A tray containing the following:

7 solution bowls containing soap, sterile water, corrosive 1-1000, 1-10,000 sterile cotton pledgets, waste basins

Double and single eye pads

Red crayon

Pad of operating slips

2-inch bandage

Adhesive plaster

Boric acid ointment.

Procedure—The following rules may be used in preparing any case wherein the operation is to be upon the eyeball. Prepare clean cases such as cataracts, glaucoma, or strabismus, first, leaving the unclean cases, including lacrimal or lid abscesses, eviscerations, etc., until last.

Female patients—Part the hair and arrange in two braids. Put on a cap covering the hair and tie under braids. Inform the patient what is to be done and have the patient sit comfortably in a chair with the head inclined backwards. Lubricate the scissor blades with boric ointment on a pledget. (This causes the cilia to adhere to the blades and prevents them from dropping into the culdesac).

Left Eye

Instruct the patient to close the eye gently. With the little finger of the left hand, fringe the lashes by pulling the

lid outward and slightly upward at the external canthus. Rest the scissors on the bridge of the nose as much as possible for support to the hand. Clip the lashes slowly, beginning at the inner canthus using the tip end of the blades. Wipe the scissors in ointment frequently. Continue this process across the lid to the outer canthus. The lashes on the lower lid may be clipped more closely by instructing the patient to look upward with both eyes open. With the thumb of the left hand press down the lower lid. This prevents the patient from seeing the scissor blade. If the patient is cooperative, clip the lashes as closely as possible. avoiding abrasions to the skin.

Right Eye

With the right hand use the scissors, fringing the lashes with the left hand. Extend the third finger of the left hand to act as a support in guiding the scissors. Clip the cilia from outer to inner canthus. No attempt should be made to clip the lashes of an infant or of any patient who is uncooperative or unusually nervous. Irrigate the conjunctival sac with warm boric solution. If drops are ordered, give them at this time.

Nurse's Scrub

The regular surgical scrub is not necessary, but the hands should be scrubbed for at least three minutes. Scrub the area around the patient's eye with soap solution, sterile water, and corrosive 1-10,000. Begin to scrub at the internal canthus, crossing the lid, up over the brow to the nasal bridge. Continue down to the tip of the nose across the cheek and finish. Do not retrace the steps with the same sponge.

Dressing

Following this apply a sterile pad and bandage. With a red crayon mark a cross on the cheek under the bandaged eye (i. e. the eye to be operated on). This attracts the attention of the surgeon and serves as a check on the eye to be operated on.

The students should be careful about making out the operating slip—that the physical and urine examination, temperature, pulse, respiration, etc., have been recorded. The slip is then carefully pinned on the shoulder of the patient with a safety pin. Patients are not to be taken to the operating room unless the slip is completely made out.

POST-OPERATIVE NURSING CARE
GENERAL RULES

Preparation of Ether Bed

Turn down the upper bed clothing to the foot of the bed and place a gray blanket crossways over the bottom sheet, tucking it in securely on both sides. Over this, a cotton half-sheet is placed. Two pillows are used, both protected by rubber cases. The first is placed in the usual manner; the second, diagonally over the first. This arrangement gives support to the back and also prevents the patient from rolling over. Over the blanket and half-sheet another gray blanket is placed and tucked in at the foot. Then the upper bed clothing which was turned down at the beginning is pulled up in place.

Warm the bed with several hot water bottles or warm blankets. If hot water bags are used, the number should be listed and then pinned on the outside of the bed, to avoid hot water bottle burns.

At the bedside have the usual equipment such as gauze, cellucotton, emesis basin, mouth gag, etc.

The post-operative care for eye cases is the same as for any other case—the patient should be specialled out of ether, with special attention to keeping the bandages and dressings in place, and to seeing that no injury is done to the eye. For these reasons it is usually best to keep the patient wrapped in blankets until the ether recovery is complete.

Following local anesthesia, no ether bed is necessary. Patients are returned to their beds from the operating room and are given low back-rests as desired.

Diet

After ether. The diet of the ether patient should consist of liquids without milk as long as nausea persists, then nourishing drinks containing milk as soon as the nausea subsides. Usually soft solid diet is given on the third day.

Local

Liquids without milk on the first day and soft solids on the second day can be given unless ordered to the contrary. In a few cases however, following serious or delicate operations, special care in preparing the diet may be necessary to prevent injury or infection. This is particularly true following cataract extractions, muscle operations, iridectomies, trephines, enucleations, etc.

Removal of Sutures

Equipment—A suture set should contain the following sterile instruments:

Eye speculum
2 lid retractors
2 pair forceps, plain and toothed

1 pair scissors
2 medicine droppers.

Sterile cocaine 4%, cotton balls, boric solution 1-50 (warm), boric ointment, and zinc solution ¼ of 1% will be necessary. At least two sterile suture sets should be kept in the ward so that no time will be lost by the doctor or the nurse in waiting for instruments to boil.

Unless in extreme emergency, instruments should not be sterilized by dropping them in alcohol. If this is necessary, a dish of boric solution should be included in the equipment in which to rinse them. Alcohol should be kept as far away from the eye as possible because of its highly irritating effects.

Make the patient as comfortable as possible during the procedure; it is usually more comfortable and convenient to place him in the dorsal position on the bed. A drop light should be convenient to the bedside in case more light is needed.

Two or three drops of cocaine (4%) are instilled at three minute intervals, to desensitize the tissues.

Resistive children should be swathed securely in a blanket. It is usually necessary to support the head firmly.

After the sutures are removed, a drop of zinc sulphate or some other antiseptic is instilled into the eye, and a liberal amount of boric ointment applied to prevent irritation from the lids.

Removal of Ocular Foreign Bodies

Injury to the cornea in removing a foreign body results so often from the use of improper instruments which abrade the corneal epithelium or because of an unskilled operator. Once the epithelium is abraded, pathogenic organisms find

their way into the wound, and a corneal ulcer is the outcome.

For these reasons nurses or any person except an eye doctor should not be allowed to remove an embedded foreign body.

Superficial Foreign Bodies

Attempts to flush out a superficial foreign body on the lid may be done without harm to the patient. Use warm boric or saline. If it cannot be removed with this procedure, apply a pad and bandage for comfort and to immobilize the lids, and send the patient to a competent oculist.

In factories all sorts of instruments have been used by the laymen in removing foreign bodies. Such things as pencil points, pen knives, soiled handkerchiefs, eye-stones, chewing gum and even the tip of the tongue, are commonly employed. Fortunately, since the institution of the factory nurse and doctor, these dangers have been markedly lessened.

Eversion of Lids

Probably the simplest method of everting the upper lid is as follows: Seat the patient in a straight backed chair and standing in front of him, instruct him to look down at the floor. Gently grasp the lashes of the upper lid, while a blunt instrument (toothpick swab or wooden tongue depressor will do) is placed against the retrotarsal fold. With the thumb and index finger of the free hand quickly pull the lid downward, upward and outward. Hold the everted lid by placing the thumb of the free hand on the cilia. With this the conjunctiva of the upper lid may be clearly viewed. That of the lower lid may be inspected by merely pulling down the lower lid as far as possible, instructing the patient to look downward.

By releasing the thumb and instructing the patient to look downward, the upper lid will fall back into place.

Embedded Foreign Bodies

Foreign bodies of steel or other metal frequently penetrate into the tissues of the eye, sometimes lodging in the folds of the iris, or even reaching the vitreous body. These of course are very serious and often require surgical treatment before they can be extracted.

An X-Ray is taken and the exact location of the foreign body determined. Then, if the foreign body is of steel, an attempt is made to extract it with the magnet. Sometimes an incision is made through which the magnet tips are introduced. Rules for operating the magnet and proper care of the extracted foreign body will be discussed in Chapter X.

CHAPTER VIII

INFANTS AND RESISTIVE CHILDREN

The problem of giving treatments to resistive children would be much harder to solve were it not for the use of the blanket swathe. Children from two to five years are perhaps the most difficult. Infants of course may be held on the lap or on the bed without difficulty.

Never attempt to do a treatment on a child over two years without a swathe; it is not only exhausting to the patience of the nurse, but very dangerous to the patient. After the patient has been swathed, and placed on the treatment table, another person should stand to immobilize the head and shoulders. The treatment nurse stands at the head of the table to administer the treatment.

Swathing the Patient

Begin by placing the child in the center of the blanket, the upper end of which is turned down about six inches from the top. With the arms at the side, bring the blanket tightly across to the right side, draping it over and across the shoulder. The left end is then carried up across the left shoulder and forms a "V" at the neck. Tuck the ends securely under the patient and fasten with safety pins at the neck, back, and at the feet.

When there is marked photophobia or oedema of the lids, it is almost impossible to hold them apart in the ordinary

FIG. 12.—Child Swathed in Blanket for Eye or Ear Examination.

manner. A third person should be secured to assist by holding the two thumbs—one on each lid, thus forcefully holding them apart. Care must be taken, however, that the pressure does not come on the eyeball. Several attempts and much perseverance may be necessary before the treatment is properly done.

In approaching older children tactfulness is undoubtedly the most important factor. Sometimes by merely outlining briefly the nature of the treatment, or even showing them some of the equipment or the utensils to be used, their confidence is often won, they are no longer afraid, and the treatment may be done without difficulty.

Infants, as has already been stated, are not difficult to manage. One of the most satisfactory methods (used entirely in the out-patient department) is for the nurse to sit at right angles to the doctor, placing the child across the lap. The head of the infant is then held between the knees of the doctor for support. A swathe is not necessary in this case.

Restraining Cuffs

Another great problem is that of preventing the children from removing or disarranging dressings and bandages after treatment. Restraining cuffs is the simplest solution.

About the only method of keeping the hands away from the dressings is to immobilize the elbows, making it impossible for the patient to flex the arm. Cuffs for this purpose may be made of various materials such as stiff cardboard or splints.

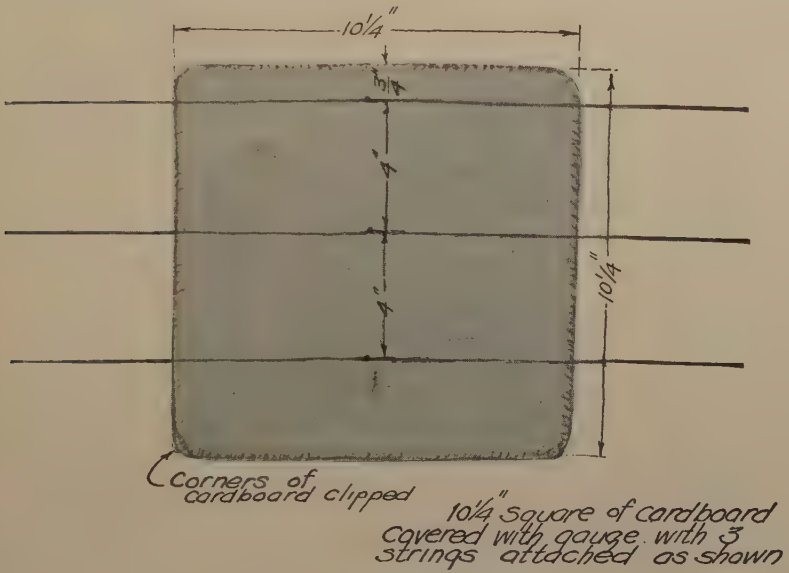


FIG. 13.—Restraining Cuffs.

Directions for Cardboard Cuffs

Use two layers of stiff cardboard about 10¼ x 10¼ inches, the corners of which have been rounded off. Cover this with two layers of gauze. Cut a strip of white oilcloth 25 inches long by 11 inches wide, folding it in the middle. The cardboard covered with gauze is then placed inside, turning in the edges of the oilcloth on three sides and overcasting them as firmly as possible.

Finish the cuff by sewing three strips of linen tape each

21 inches long down the center. The first one is placed 3/4 inches from the top edge and the next two each 4 inches apart. These are used in tying on the cuff as it is rolled about the infant's arm.

The undershirt sleeve should be pulled down as far as possible and turned up about three inches over the lower edge of the cuff. This prevents it from slipping down over the wrist.

One advantage in the use of oilcloth is that it is easily cleaned with soap and water. Any material which can be easily cleaned may be used.

Tie the tapes with double knots to prevent the children from attempting to unloosen them with the teeth.

CHAPTER IX

INFECTION AND CONTAGION

The delicate, sensitive tissues of the eye are more exposed to atmospheric conditions, dust, and infection than those elsewhere in the body. Irrespective of this, however, it is an interesting fact that few organisms are to be found in the conjunctival sac regularly, white staphylococci and xerosis bacilli being the most common non-pathogenic organisms. The pneumococcus and the staphylococcus are the most commonly found of the pathogenic group.

External infections of the eye and various modes by which they are transmitted will be discussed, because it is with these infections that nurses are most apt to come in contact while nursing in hospitals, in the district, or in the schools where many of these infections are common.

Conjunctival Infections

Infections of the conjunctiva may be either mild or severe. An example of the former is the hyperemia of the conjunctiva caused by various atmospheric conditions, such as dust, wind, smoke, exposure to bright light, etc.

Other forms of conjunctivitis more severe are the catarrhal and purulent variety, the most common form of which is the acute contagious conjunctivitis, or "pink eye." This spreads in epidemic form, is caused by the Koch-Weeks bacillus, and is very contagious.

Purulent conjunctivitis, including ophthalmia neonatorum, may be due to contagion from a gonococcus, pneumococcus, staphylococcus, or streptococcus. In this form a thick purulent discharge containing the organisms is characteristic.

Another form perhaps less common is a diphtheritic conjunctivitis caused by contagion from cases of diphtheria. It appears chiefly in children.

Conjunctivitis may accompany acute infectious diseases such as measles, influenza, or typhoid fever, although these are classified as endogenous infections.

One of the most contagious diseases of the lids is trachoma or granular conjunctivitis, producing an infectious secretion.

Modes of Infection

In the diseases outlined, infections may be transmitted by direct or indirect contact. In each case, the discharge is very infectious and strict precautions must be observed in the treatment of such cases to prevent infection to the other eye (unilateral infection), between patients, and as a protection to the nurse. A gown and protective glasses should be worn during the local treatment and bedside procedures. The bed linen should be tied in separate laundry bags and tagged with the name of the disease and the ward before it is sent to the laundry.

Care of the hands in infectious cases cannot be emphasized too much. After treating a patient, scrub them thoroughly and soak for three minutes in bichloride 1-1000 before going to the next patient.

Occasionally both eyes may be infected by different organisms (e. g. gonococcus and pneumococcus), in which case treat the less virulent infection first, if this is possible to

determine, and scrub the hands thoroughly before treating the other eye.

To protect other patients or members of the family, instruct the patient concerning the care of his own hands, to avoid handling the face, eyes, etc. Unless this precaution is observed it is an easy matter to spread the infection to other parts of the body. This is particularly true in gonorrhoeal conjunctivitis. A separate wash cloth for the face should be used also.

Cases of unilateral infection must be treated with care to prevent infection to the other eye. During a treatment, place a piece of cotton or cellucotton over the well eye, taking care that no secretion or solution runs over the nasal bridge during the procedure.

Infection may be harbored by the secretion from Meibomian glands accumulated between the cilia, which, when moistened by the tears, serves as an excellent culture medium for bacteria. Another channel of infection is the naso-pharyngeal tract and the tear sac which serves as an excellent store house for bacteria.

It seems important that nurses should be informed as to the diseases reportable to the Board of Health, namely, trachoma, and any form of purulent conjunctivitis.

Trachoma is probably transported into this country by foreigners, although they are compelled to undergo a rigid examination to rule out this condition before admission to the country. Any passenger showing the slightest manifestation is deported. In certain localities in this country, the disease is prevalent and should be watched for in thickly populated districts. These cases are directed by the Social Service Department into the clinics for treatment and are

compelled to enter the hospital for treatment if it is deemed necessary. In the acute lacrimating stage trachoma is said to be most infectious.

The Department of Health in the state of Massachusetts sends a copy of "The Law to Prevent Blindness in Babies" to all registered physicians in the commonwealth. The substance of this publication is as follows: "If one or both eyes of an infant become inflamed, swollen, or red, and show unnatural discharge within two weeks after birth, Chapter 177 or 194 of the Acts provides that the nurse or other attendant in charge of the child shall report within six hours to the local Board of Health." This law also requires that the doctor in charge of the case, knowing of the symptoms, shall also report. Those failing to obey this law are liable to a fine.

It is hoped that this brief outline of the more common infectious diseases of the external eye will give the student some idea of the nature and degree of severity of these infections and sufficient information for their recognition and prevention.

CHAPTER X

OPERATION PROCEDURE AND OPERATING ROOM ROUTINE—STERILIZATION

Eye Operations

After the patient has been prepared as described in Chapter VII the patient is taken to the operating room and placed in a cataract bed.

A half hour preceding the operation the preliminary preparation is begun by carefully raising the eye pad while a drop of cocaine 1% is instilled.

Three drops are given one minute apart, or every five minutes for four drops, depending upon the doctor's orders. This procedure must be done with care not to contaminate the prepared field.

After this preliminary preparation the patient is taken into the operating room, where the final preparation is done by the doctor.

The patient's complete record (ward and out-patient department) should accompany him to the operating room.

The prepared eye should be turned nearest the window. To prevent the bed from moving, place each caster on wooden bed blocks, high or low as desired. This can be done with the aid of the orderly.

The nurse's duty at this time should be to cut the band-

age, remove dressings and place sterilized instruments on the sterile table.

The draping used about the patient's head consists of a half-sheet on top of which is placed a towel. The patient's head is lifted by the nurse while the doctor drapes the head with the towel. The other part of the draping covers the pillow. The towel is fastened with a towel clip.

The doctor then swabs the area, lid, brow, nose, and cheek with 1% iodine. The culdesac is irrigated thoroughly with warm boric, using a bulb syringe followed by a drop of protargol 4% or mercurochrome 2%.

Injection

Procaine 1% to which has been added a few drops of adrenalin 1-1000 is injected intra-orbitally. Use a Record syringe and long thin needles 25 gauge 1½ inch. Just before the incision is made, a drop of 10% procaine is often instilled.

Instruments

The instruments used for all eye operations are the same with the exception of a special few used for certain operations. Those used in cataract extractions can be taken as typical.

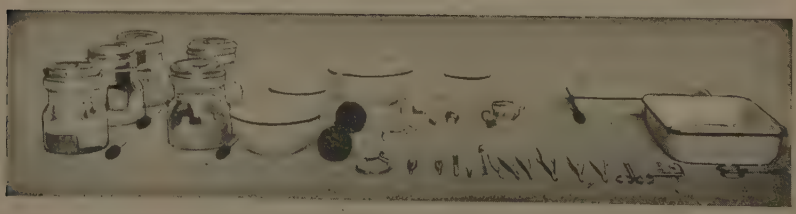


FIG. 14.—Eye Instruments (Cataract Set).

They are as follows:

Cataract knife
Speculum
2 fixation forceps
2 capsule forceps
1 pair Verhoeff (straight) scissors
1 pair curved iris scissors
1 cystotome
1 spoon scoop
2 iris replacers
Large strabismus hook (for counter pressure)
Needle holder
Sutures No. 1 and No. 2 black silk on No. 3¼ or ½ curved needles.

These instruments, with the exception of the knife and cystotome, should be boiled for 10 minutes and then placed on the table or instrument rack. Dip the knife and cystotome in 95% alcohol for 10 minutes. Rinse in cold saline. A piece of folded gauze or compress should be placed in the bottom of the instrument pan on the sterile table to protect the keen edges of the instruments.

The diagram will show the arrangement of the equipment on the table.

Several pieces of dry compress should be included in the equipment to be used in drying the instruments as they are taken out of the alcohol.

During the operation it may be necessary for the nurse to hold the light, replenish the equipment, and to reassure the patient.

Operations upon the eyeball are extremely delicate and the cooperation of everyone including patient, nurse, and orderly is very necessary. The attendant, for example, must direct the light steadily and accurately on the area of operation.

While one operation is in progress, cocaine should be started on the next patient.

The treatment immediately after operation varies according to the doctor. Usually sterile ointment—boric, White's

or atropin ointment—is prescribed for both eyes, followed by the application of a double bandage. Two pieces of silk isinglass should hold the dressing in place under the bandage.

Cataract dressings and ties must be applied with great care. The patient must not voluntarily raise the head, but must allow the nurse to slide the long ties under the head with the hand. The tie should be fastened on the side of the operated eye. This is to prevent the patient from the discomfort of lying on knots when turned on the opposite side from the operation.

For all enucleations and plastic operations a single bandage is applied.

OTHER OPERATIONS

Iridectomies

Use the same equipment as for cataract extraction, omitting the lens spoon, capsule forceps, and cystotome, and adding a keratome.

Trephine

The instruments are the same with the addition of a trephine handle and blade. Sometimes angular scissors are added.

Strabismus

Omit the iris replacers, capsule and iris forceps, and add Prince forceps, two strabismus hooks and a pair of Stevens tenotomy scissors.

Enucleation

Add hemostats, glass ball introducer, and enucleation scissors. A specimen bottle containing formalin 10% will be necessary in which to drop the eye. This is sent to the laboratory for examination and study under the microscope.

Discission

Add discission needle, speculum, and 2 pairs of forceps (fixation). These are the only instruments used, but sometimes a replacer is added.

Foreign Bodies of Steel—Use of Magnet

Locally the preparation is the same as for any eye operation. The instruments which should be non-magnetic, are the same as those used for an iridectomy. This is because it may be necessary to remove the foreign body through the iridectomy incision. Usually it is removed through the opening made by the foreign body as it penetrated the globe. Magnet tips of varying sizes should be boiled and placed on the table. The small magnet is held wrapped in a sterile towel.

Procedure—Giant magnets are usually employed first in an attempt to attract the foreign body and pull it out into the anterior chamber.

The tip of the magnet is wiped off with alcohol and the patient is then seated directly in front of the magnet with the eye as close to it as possible. (All watches should be removed and placed several feet away from the magnet while it is in use to prevent their magnetization). When the patient's head is in the position desired by the doctor, the current is switched on for a brief period. The patient's head of course must be held firmly while the current is on, and although this procedure may be painful to the patient, it is usually successful in attracting the foreign body into view.

With the foreign body located, the patient is put to bed and the eye cocainized while a keratome incision is made. Through this opening small magnet tips are inserted and the foreign body removed.

Dressing

Atropin solution 1% or ointment is put into both eyes and a double bandage applied. The patient should remain in bed for several days to lessen the danger of complications.

Disposal of Foreign Body

Place the foreign body carefully on a square of folded compress so as to contain it safely and place it in an envelope upon which has been written the name and age of the patient and the date and name of the doctor. Extracted foreign bodies must be placed on file as many of these cases are connected with insurance companies which may bring them later into court.

Operating Duties

Never leave the operating room during an operation unless relief is provided. The duties of the student nurses are preparing the patients, setting up tables, transporting patients in and out of the operating room with the assistance of an attendant, holding the operating light when necessary, and applying dressings, etc. These duties of course must be outlined in detail to the student nurse by the head nurse.

In addition to these duties of the student nurse, they should be given an opportunity to observe during the operation and to scrub up and assist whenever possible. Caps and gowns are worn at all times in the operating room.

Instruments used in eye operations, particularly those with cutting edges, such as knives, keratomes, and cystotomes require constant attention and repair. Daily inspection must be made before they are placed upon the sterile table. To test, place the handle of the instrument in the palm of the

hand bringing the blade in contact with a very thin test kid. If the blade penetrates the kid easily, the knife may be used in the operation.

For emergencies a locked box containing morphine and stimulants such as strychnin and caffeine should be included in the equipment of the operating room.

The Mason jars containing the sterile solutions and droppers should be allowed to stand in alcohol for five minutes before they are placed on the table. It is not necessary to change these jars between operations.

Sterilization—Solutions, Ointments, Instruments, etc.

Solutions

Sterilize all solutions such as saline, boric acid and water in glass quart flasks for 45 minutes under 15 pounds pressure, moist steam.

Place eye washes in small bottles, inside ½ pint Mason jars. In the bottom of the jar place a piece of folded gauze to prevent the bottle from slipping around. The top covers of the jars are removed in the process of sterilization. The drug may be labelled by printing the name on a piece of paper and placing it, name outward, inside the jar. A sterile medicine dropper is placed inside the jar, before it is placed upon the sterile table for use.

Ointments

In tubes—Screw on the caps of the ointment tubes tightly and then place them in a small solution basin. A piece of compress or gauze in the bottom of the basin will absorb the ointment if it leaks out during the process of sterilization. Ointment is sterilized for 45 minutes under 15 pounds pressure. Ointment contained in jars must be sterilized daily, once the jar is opened.

Instruments

Eye instruments are sterilized by boiling five minutes. All cutting instruments except scissors are sterilized by dipping in boiling water for 30 seconds, followed by 10 minutes in 95% alcohol, and rinsed in saline before use. This includes knives, keratomes, etc.

If the instruments are to be boiled, about a dram of soda-bicarbonate added to the boiling water will prevent them from rusting.

CHAPTER XI

ARTIFICIAL EYES

Artificial eyes are fitted some time between 2 and 4 weeks following the enucleation. About this time the socket is sufficiently healed so that the patient is able to tolerate the pressure of the eye against the sensitive tissues. Authorities disagree concerning this. Some believe it should be worn immediately following the enucleation to assist in forcing the tissues back in place and at the same time preventing cicatricial contraction.

Removal of Artificial Eye—Care of Socket

Equipment—Warm boric solution (folded compress in bottom of basin)

Waste basin

Toothpick applicators.

Place the patient in the dorsal position. Lower the lid with the index finger of the left hand. With the right hand gently push the toothpick applicator under the lower edge of the eye at the external canthus, passing it along to the internal canthus. The air, as it gets in under the shell, assists in undermining it, and the slighest counter pressure against the upper lid causes it to slide out easily. Place it in a dish of warm boric solution.

Keep the socket clean and free from irritation with frequent irrigations of boric acid solution each time the shell

is removed. Unless some irritation is evidenced, no further treatment is necessary.

Replacing the Eye

To replace, pick up the eye between the thumb and index finger with the widest portion nearest the external canthus. Gently place the upper edge of the eye under the upper lid. By depressing the lower lid, the lower edge of the eye is fixed. In releasing the lid, the shell slips into the socket without difficulty.

Instruction to Patients

Patients should be taught the proper care of the artificial eye and the socket—how the eye should be removed and replaced. At night the shell should be removed and placed in a covered receptacle of water. Cleanliness of the socket should be emphasized.

CHAPTER XII

THE OUT-PATIENT DEPARTMENT

Out-Patient Department work is very important and much valuable experience can be derived from seeing the great variety of patients in the clinic each day.

Interested and observant students who ask questions and are eager to learn will reap unlimited benefit from this duty. The staff doctors and internes are usually very willing to demonstrate the cases or answer questions. Careful and close observation on the part of the student in following the examination with the doctor, in conjunction with supplementary reading in text books, will assist them in retaining a complete picture of the disease. Students are urged to take occasional notes on unusual and interesting cases, for class discussion.

Eye Examination

The examining chair or stool should be placed at right angles to the doctor. Remove hats, glasses, and dressings preceding the examination. Minor post-operative cases such as styes, chalazia, pterygia etc., are seen in the big clinic room, but patients with large post-operative dressings are removed to the treatment room outside the clinic.

During the examination of such cases as foreign body, or tear sacs, at which time the lacrimal duct may be probed, hold the flashlight and support the patient's head.

Among other duties in the clinic students are expected to set up equipment for the following tests and procedures: probing of the lacrimal duct, Wasserman tests, smears, tuberculin and subconjunctival injections; and also to prepare patients for operation, to set the sterile table, and to dilate pupils preparatory to refraction.

Preparation for Refraction

The pupils are dilated preceding refraction in order to paralyze the accommodation. This is called cycloplegia and allows a much more accurate determination of refractive errors to be made.

Procedure—Homatropin 2% is instilled into both eyes, a drop every 10 minutes for 1½ hours, or until the pupils are fully dilated. Write down the number of doses required and check off each as given.

Drops are given in the clinic, with the patient in an upright sitting position with the head inclined slightly backward, while the nurse stands in front of the patient. Hold the dropper in a horizontal position with the right hand. Hold a cotton pledget under the lid to protect the patient.

Children in the Clinic

Infants should be held on the lap as described in Chapter VIII unless they are crying loudly or making a general disturbance, in which case they are moved outside the clinic room where the noise is not disturbing to the other patients.

Older children should be taken to the examining room to be swathed before the examination is attempted.

Lacrimal Set

Used in probing the nasal duct in cases of obstruction.

Equipment—

2 c.c. Luer syringe
Lacrimal probes size 1 to 6 inclusive
Punctum dilator
Lacrimal needles (2).

Separate the syringe, wrap it in gauze, and boil for 5 minutes. Include a dish of boric solution in the equipment in which to cool the instruments before use.

Smears

In the examination of a patient with discharging eyes, a smear of the secretion is taken and examined under the microscope in order to isolate the organism.

Nurses may or may not be required to take smears.

Equipment—

Alcohol lamp
Glass slides
Platinum wire.
Matches
Cover glasses
Red pencil.

The patient with his record is removed from the clinic. If the patient is a child, swathe in a blanket and hold it across the lap, holding the head as firmly as possible.

Sterilize the wire by holding it in the flame until it becomes white hot. After cooling, pass the wire along the inner surface of the lid, collecting enough of the secretion to spread in the center of a glass slide. Flame the slide before and after the preparation, and cover with a cover glass. With the red pencil write the name of the patient and the date on the glass and send the slide to the laboratory for examination. This is examined at once and the report given before the patient leaves the clinic.

Wasserman Test—Blood Samples

Equipment—

2 sterile culture tubes
30 c.c. Luer syringe and 2 long needles

1 tourniquet
2 sterile towels
1 bottle iodine with brush
Collodion
Adhesive
Alcohol 70%
1 block form (laboratory slips)
2 solution bowls.

Procedure—Wrap a towel around the upper arm and apply the tourniquet. The tightness of it should be regulated by the radial pulse. With a sterile sponge prepare cubital space with tincture of iodine followed by alcohol. Wrap the forearm in another sterile towel. Boil the syringe and needles. Have the culture tubes in readiness to receive the blood when drawn by the doctor.

Fill out the laboratory slip, wrapping it around the tube and send it to the laboratory.

Wipe off the skin with a sterile sponge and alcohol and cover the puncture with flexible collodion. Wash out the syringe at once with cold salt solution to prevent the blood from coagulating therein. Boil the syringe and needle before returning them to their proper places.

Tension

Measuring the tension, or intraocular pressure of the eye is a test frequently done. Glaucoma is the disease in which an increase in tension is manifested. This test is accomplished by an instrument known as a tonometer (Souter's, MacLean's, or Schiötz's).

Procedure—The preparation is very simple, consisting of the instillation of three drops of holocaine, 1% in each eye, one minute apart. This is done to desensitize the cornea upon which the instrument rests directly.

Place the patient in the dorsal position, with the eyes

directed to a fixed point on the ceiling. The nurse may be of assistance by holding her fingers above for the patient to fix at.

Removal of Ocular Foreign Body

Foreign bodies of steel, iron, or particles of dust and dirt may be removed in the clinic. A local anesthetic is necessary. Usually one of the following is used:

Cocaine 4%, 4 drops one minute apart,
or cocaine 10%, 1 drop.

Equipment—

Foreign body instruments
Loupe
Flashlight
(also usual clinic table equipment).

Support the patient's head and hold the flashlight during the procedure. A drop of cocaine or holocaine may be prescribed following the removal.

Conjunctival Injections

To break up posterior synechiae or adhesions to the iris and lens, subconjunctival injections of adrenalin chloride 1-1000 are given.

Equipment—

Luer syringe and needle
Fixation forcep
Eye speculum
Small salt dish
Adrenalin 1-1000
Procaine 2% (sterile).

Procedure—Cocainize the eye with cocaine 4%—4 drops, one minute apart. It is an extremely painful treatment, therefore plenty of time is taken to allow the cocaine to take effect before an injection is given.

About 5 or 7 minims of adrenalin are injected. After

the injection, observe the reaction of the pupil carefully. The pupil may respond, and dilate slowly or it may be unresponsive and dilate irregularly, or not at all.

Report to the doctor if the desired reaction is not obtained. Morphine or cocaine is frequently necessary to deaden the pain following these injections.

Clinic Operations

After clinic hours minor operations such as incision of hordeola, chalazia, etc., are performed. A half hour before operation, the preliminary preparation is begun.

The preparation consists of 5 drops of cocaine 1% in the eye to be operated, at three-minute intervals.

Patients not of age must be accompanied by a parent or guardian who is required to write a permission if ether is to be given. Some authorities require children under 11 years to have a thymus X-Ray before ether.

Set up the sterile table, with solution bowls, sterile cotton, gauze, and sheets. The instruments depend upon the operation. (See Chapter X).

Apply sterile dressings if ordered following operation.

Other Duties

Students may be of great assistance to the head nurses in guiding the patients about the clinic into various departments—vision room, social service, etc. It may be necessary to explain the doctor's prescription and directions more explicitly—how to use the medicine, etc. Be sure that all directions are clearly understood and that the patient knows the day on which he is expected to report for further treatment before he leaves the clinic. This is of extreme importance as the doctors alternate days in the clinic, and unless

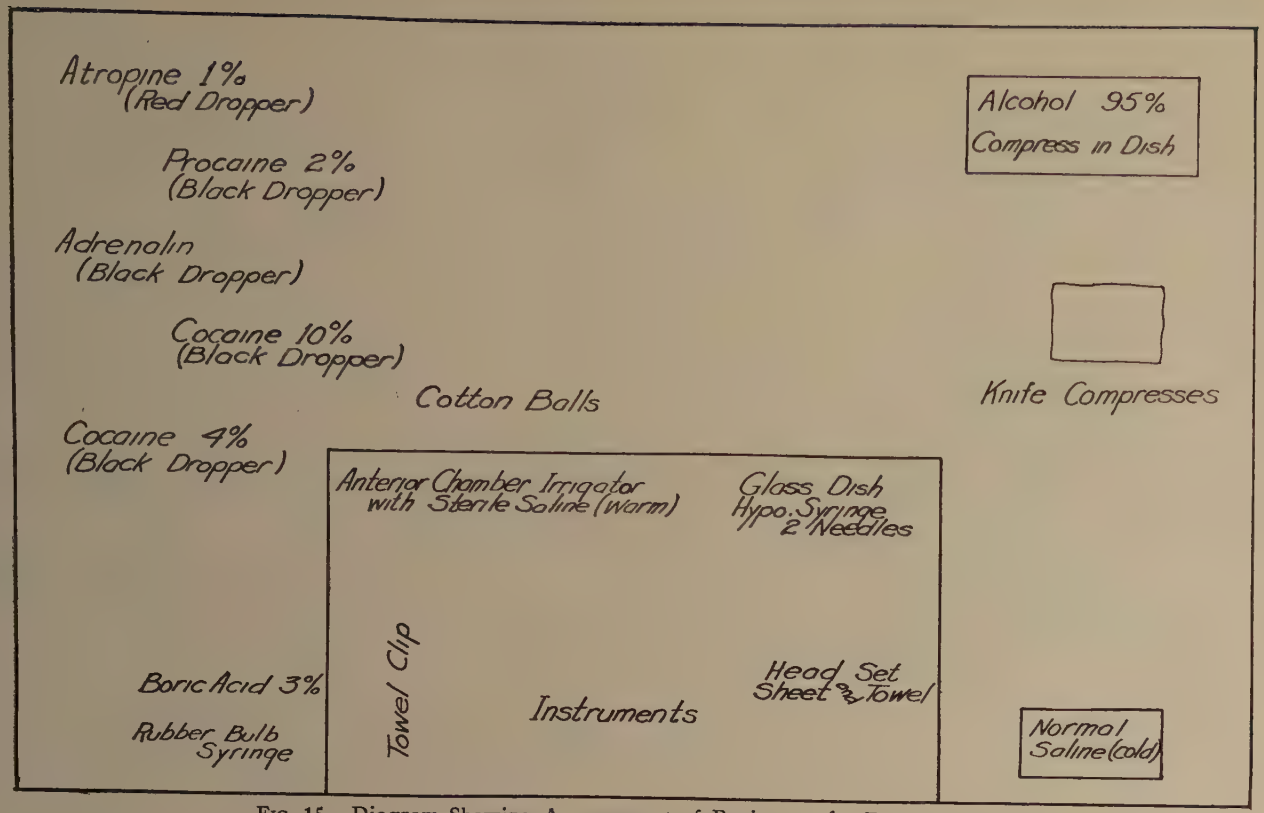


FIG. 15.—Diagram Showing Arrangement of Equipment for Eye Operations.

patients report on the proper day, close follow up work is impossible.

Keep close watch of the tables, replenishing solutions and equipment as necessary.

The equipment of the clinic, the clinic tables and the instruments, etc., are the responsibility of the head nurse, but the students are entirely responsible for the orderly arrangement of the equipment on the tables.

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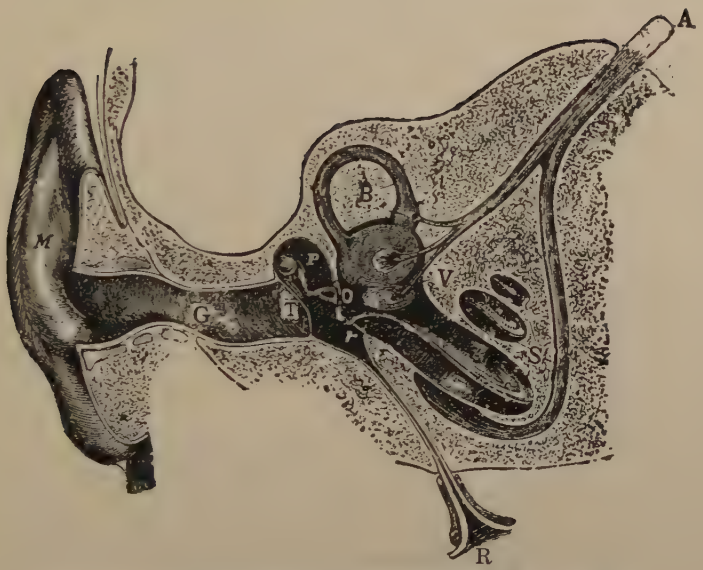

Fig. 16.—Semi-diagrammatic Section through the Right Ear.
(Kimber and Gray, 7th Edition)

CHAPTER XIII

ANATOMY AND PHYSIOLOGY OF THE EAR

There are two divisions to the ear, the sound conducting apparatus and the sound perceiving apparatus.

Sound Conducting Apparatus

This includes the external ear, the external auditory canal, the middle ear and its contents, and the mastoid process.

External Ear

Auricle or pinna.

Divisions—Tragus, antitragus, helix, antihelix, fossa of the helix and lobe.

External auditory canal.

Middle Ear

Tympanic membrane
Ossicles
Mastoid process
Eustachian tubes
Middle ear muscles, ligaments, and spaces.

Sound Perceiving Apparatus
Internal Ear

Cochlea
Vestibule (Static labyrinth)
Auditory nerve—Nuclei and association paths.

External Ear

Auricle—The auricle is composed of a fibro-cartilaginous framework covered by perichondrium and skin. It is attached to the malar and to the temporal bone by ligaments and muscles. The skin is covered with fine hairs and contains sebaceous and sweat glands. There are two groups of muscles, one affecting the shape and the other affecting the movements of the auricle. The outer edge of the auricle bends forward forming a ridge, the helix, and opposite to this is another ridge, the antihelix. Between the two is the fossa of the helix. At the opening of the auditory canal is a projection called the tragus and opposite is a depression, the antitragus.

Blood Supply

The blood supply for the auricle and external auditory meatus is derived from the temporal and internal maxillary arteries.

External Auditory Canal

From the auricle the external auditory canal is directed backward, upwards, and slightly forward. It extends from

the tragus one and one-fourth inches to the drum membrane. The outer two-thirds consists of cartilage and the inner one-third of bone. The narrowest point where the bone and cartilage join is called the isthmus. Due to the narrowness foreign bodies are most likely to lodge at this point.

Lining

The skin contains sebaceous glands, ceruminous glands and fine hairs which tend to prevent the entrance of insects and other foreign bodies. The drum membrane at the inner end of the canal is inserted into a ring of bone known as the annulus tympanicus. In infancy, the annulus is a cartilaginous ring.

Tympanic or Drum Membrane

The drum membrane, oval in shape and slightly concave is of about the thickness of tissue paper. It is placed obliquely at the inner end of the external auditory canal with the concave side outward. It is composed of three layers, an external of epidermis, an internal of mucous membrane, and between the two a fibrous coat.

The epidermoid layer is continuous with the lining of the external auditory canal, and the mucous with that of the middle ear. In the fibrous coat is embedded the handle of the malleous.

The drum membrane is divided into two parts; the lower portion or true drum membrane is tense and inelastic and the flaccid portion above is known as Shrapnell's membrane. Surgically, the membrane is divided into four quadrants, namely, antro-superior, antro-inferior, postro-superior, and postro-inferior.

Function—To transmit vibrations to the ossicles.

Middle Ear

The middle ear is an irregular air-containing cavity in the petrous portion of the temporal bone.

Boundaries—The *outer wall* is formed by the drum membrane. The *floor* is a thin plate of bone covering the jugular fossa and carotid canal. The *roof* or *tegmen* is formed by another thin plate of bone separating the middle ear from the middle cranial fossa.

At the angle formed by the roof and the inner wall is a ridge and within it the Fallopian canal, containing the facial nerve. Below this is the fenestra ovalis, or the oval window. Anterior to the oval and round windows is the promontory behind which is the first whorl of the cochlea.

The mastoid process and cells form the *posterior wall.* On the anterior wall is the orifice of the Eustachian tube and the canal for the tensor tympani muscle.

The upper part of the middle ear behind Shrapnell's membrane is known as the epitympanic space. In this space is the head of the malleous and body of the incus. Originating in the epitympanic space is a canal called the aditis ad antrum, leading to the mastoid antrum.

Blood Supply

The blood supply of the middle ear or the tympanum is derived from the external and internal carotid arteries, their branches, and their corresponding veins.

Ossicles

Within the middle ear are the ossicles. These are the malleous, incus, and stapes, forming a chain-like arrangement connecting the drum membrane with the oval window and inner ear. The ossicles articulating, transmit the vibrations to the internal ear through the oval window.

Muscles

There are two groups of muscles in the middle ear:

1. The *tensor tympani* which stretches the drum by pulling the malleous inward.

2. The *stapedius,* controlling the foot plate of the stapes.

Ligaments

The ligaments of the middle ear are the inco-stapedinal, the superior ligament of the malleous, anterior ligament of the malleous laterial ligament of the malleous, and posterior ligament of the incus.

Nerve Supply

The middle ear is supplied by the seventh or facial, tympanic plexus, trifacial (branches), and spheno-palatine ganglion (branches).

Mastoid Cells

These are found in the mastoid process, communicating with the middle ear by the antrum through the aditus and the attic or epitympanic space. Three types of mastoids are recognized—the pneumatic type with large air cells, the diploeic type with small air cells, and the sclerosed type with no cells.

Eustachian Tube

The orifice of the Eustachian Tube is found on the anterior wall of the middle ear cavity. This tube, consisting of a bony and cartilaginous portion is about one and one-half inches long and is lined with mucous membrane containing ciliated epithelium. The bony portion is adjacent to the middle ear; the pharyngeal portion is cartilaginous.

In childhood, the canal is straight and in a horizontal plane, thus favoring infection of the middle ear; in adults it is more oblique.

Function—The function of the Eustachian Tube is to regulate or to equalize the pressure of the outside air with that of the middle ear cavity. It also assists in transmitting sound to the middle ear.

Internal Ear or Labyrinth

It is made up of the cochlea, the semicircular canals and the vestibule.

Sound Perceiving Apparatus
Cochlea

The cochlea, so named because of its resemblance to a snail shell, makes two and one-half turns on itself around a central pillar or modiolus terminating above in a culdesac or cupula.

It is composed externally of a bony cochlea, and internally of a membranous cochlea. Between the bony and membranous cochlea is a fluid called the perilymph. Likewise within the membranous labyrinth (internal ear) is another fluid called the endolymph. These fluids are somewhat similar in composition to the spinal fluid.

Within the cochlea is a spiral bony plate pierced by small canals which carry the cochlea division of the auditory nerve, the filaments of which are known as the Organ of Corti.

Blood Supply

The internal auditory artery and its branches supply the labyrinth. It supplies three branches, one to the saccule, one to the utricle and the horizontal and vertical canals, and a third to the posterior vertical canal.

Function—The cochlea is the end organ of hearing, the Organ of Corti being the precipient element.

Semicircular Canals

These canals, three in number are known as the horizontal anterior and posterior vertical canals. Their structure is similar to that of the cochlea in that they have a bony canal without, and a membranous canal within. The perilymph separates the bony and membranous canals. The membranous canal contains the endolymph. The points at which the canals join are called ampullae.

Function—As the fluids within the canals are set in motion, we are able to determine the plane in which to sit, stand or lie down. In other words, the semicircular canals assist in maintaining equilibrium.

Vestibule

The vestibule is the connecting link between the cochlea and the semicircular canals. It is made up of the utriculus and the sacculus.

Physiology of Sound

Sound waves or impulses arise from the motion of air molecules produced by some vibrating body, and are classified as musical and non-musical notes. When the vibrations occur singly or follow each other regularly or rhythmically, they produce a musical note.

A sound is known to have three chief properties, pitch, intensity, and timbre. The pitch of a sound depends upon the rapidity with which the vibrations follow one another, the more rapid the vibrations, the higher the pitch. The intensity of the sound depends upon the amplitude of the vibrations. Timbre, the third quality, enables us to distinguish tones of the same pitch as produced by different musical instruments.

The human ear can appreciate only a certain range of air vibrations. This range or series is called the range of audibility, embracing usually about eight to ten octaves, the lower limit being about eight vibrations a second, the upper limit varying from thirty to fifty thousand per second. Within these limits are all the sounds which the ear can appreciate, and the normal ear will respond to any vibration within these limits of audibility. There are pathological conditions, however, in which there is a loss of sensibility for certain groups of sounds within the limits of audibility, in other words there are gaps in the series from the lowest to the highest note. These gaps are called tone islands.

Physiology of Hearing

The auricle serves to collect sound waves. In man it is not essential, although the concha and the walls of the meatus reflect sound waves giving a concentration of the waves on the drum.

The middle ear transmits the sound vibrations from the drum to the internal ear or perceiving apparatus. The membrana tympani is induced to vibrate by all notes within the limits of audibility. In the drum is inserted the long handle of the malleous which transmits this vibration to the incus, and it in turn articulates with the stapes, which carries the vibration through the oval window (into which it fits) to the inner ear.

Covering the oval window is a membrane holding back a fluid, the perilymph, through which is transmitted the vibration of the stapes. Thus every vibration sets in motion the perilymph which fills the bony labyrinth and cochlea canals, external to the membranous labyrinths. The vibrations are then communicated to the endolymph which stimulates the

delicate endings of the auditory nerve, the organ of Corti. The Organ of Corti translates the mechanical vibrations into nerve impulses, and these travel up to the brain to be perceived and interpreted.

CHAPTER XIV

DRUGS

Use and Classification in the Treatment of Diseases of the Ear.

1. Antiseptics and Germicides

Mercurochrome 1-5%.

Uses—Mercurochrome 2% is used externally in preparing the ear for operation. Intravenously, mercurochrome 1% is given for septicemia with positive blood culture. The amount given varies with the weight of the patient.

Alcohol

Alcohol 70%

Uses—To sterilize catgut tubes and non-boilable instruments.

To cleanse external wounds.

Alcohol dressings.

Alcohol 50%

Uses—Middle ear irrigations.

Iodine

Uses 3%—Skin preparation for operation.

1½%—To stimulate granulations in post aural wounds.

Iodoform

Iodoform, a compound of methane and iodine containing 97% iodine, is used in the form of a powder to make iodoform gauze.

Uses—Packing for mastoid wounds. Stimulates granulations when healing is delayed in a simple mastoid.

Solutions for Ears (Full strength or one-half strength).

Boric acid oz. ss

Spts. Vim Rect. oz. 1

Sig: 5-10 gtts. in ear t.i.d.

Uses—1. To dry up and to reduce granulations in chronic discharging ears.

2. On wicks for the treatment of furunculosis of the external auditory canal.

Aluminum Acetate 8%

Used as abortive treatment for furunculosis of the canal.

Hydrogen Peroxide 3% sol.

Uses—As a cleaning agent when its oxidizing property is desired.

Saline

Use—Ear irrigations; salt 1 oz. to pt. water. At 110° F. it is used for ear irrigations. Wet dressings for local skin infections.

Aristol

A substance containing iodine used in much the same capacity as iodoform.

A dusting powder for radical mastoids, or chronic discharging ears.

Glycerine and Phenol

Phenolis mx

Glycerine ad oz. 1

In the treatment of furunculosis of the ear, phenol cauterizes the furuncle and sterilizes the canal. It is supposed to relieve pain, and hasten spontaneous rupture of the furuncle.

Ether

To remove cholesteatome. The canal is filled with ether and allowed to stay 5-10 minutes if the patient can stand it.

2. Stimulants

Drugs which promote granulations and growth of epithelium.

Iodine and iodoform are also included under this heading.

Scarlet Red 5-10%

Stimulating and astringent in its action; used to produce epidermatization of radical mastoid cavities.

3. Escharotics

Drugs used to destroy the skin over which they are applied (Blumgarten).

Silver Nitrate Stick

Use—1. To cauterize post aural granulations.

2. In the form of a silver nitrate bead, to cauterize granulations in the middle ear.

into the canal. This is to prevent injury to the canal or the drum membrane with the point of the pick. Dry wiping the canal preceding irrigation prevents the secretion in the anterior portion of the canal from being forced inward against the drum beyond the possibilities of removing it. Connect the ear tip to the rubber tubing. Exhaust air from the tube and introduce the tip into the canal about one-fourth inch. In a rotary motion direct the flow upward toward the roof of the canal. Continue this until the return flow is clear. Regulate the pressure of the solution with the thumb and index finger on the tubing or with a metal clamp attached. Irrigations which cause the patient to be dizzy or nauseated should be discontinued at once, and the effect reported at once to the doctor. The character and amount of discharge should be observed from day to day and any unusual signs reported to the head nurse. Following the irrigation wipe out the canal thoroughly; moisture creates irritation.

Ear wicks are not used without the doctor's order excepting at the time of preparation for operation to block off the canal during the haircutting process.

Irrigation for the Effect of Heat

Purpose—To assist in localizing the infection preparatory to paracentesis, irrigate the ear with two quarts of saline, 110° F. The effect of the heat on the membrane acts as a poultice to a boil or abscess elsewhere on the body. The drum may rupture spontaneously but if not, a paracentesis is done to evacuate the pus.

Procedure—The procedure is the same as for any irrigation.

Impacted Wax

Purpose—Frequently large plugs of hardened wax are removed from the auditory canal. Occasionally they are attached to the epithelial layer of the drum membrane. Ceruminous plugs may be removed with irrigations of tepid solution or with the assistance of instruments.

Equipment—

Metal piston syringe
Water—1 quart tepid
Soda bicarb. or peroxide in water—dram 1
Waste basin, large
Kidney basin
Toothpick swabs
Rubber sheeting
Rubber cape
Towel.

Procedure—Drape the patient as for any irrigation and place a rubber sheet across the lap for protection. With the piston syringe introduce the stream into the canal slowly at first, directing it on one side and then on the other. Increase the pressure slowly. The solution should not be directed straight inward against the plug, as this forces it against the drum more firmly and subsequently makes the removal more difficult. Occasionally difficult cases are sent home to put glycerine drops in the ears over night in order to soften the plug, thereby facilitating the removal the following day.

The main difficulty in these irrigations is to exert sufficient force to dislodge the plug and at the same time to avoid injury.

Nurses unable to remove a ceruminous plug in the manner described are never permitted to use a probe, cerumen hook, or any other instrument. Likewise following any irrigation, dry wipe the ear carefully. There is no particular

Aural Ice Bags—These are often used to reduce oedema and relieve pain in acute mastoiditis.

Procedure—Crack the ice very fine. Then place it in the ice bag. Aural ice bags should be covered with bandages or thin gauze. Attach the bag to the mastoid process, slipping the auricle through the opening and bandage to the head.

An aural ice bag should be applied only for a half hour at a time alternating with a half hour off to prevent frost bite.

Leiter's Ice Coil

This means of applying cold in mastoiditis is used less frequently than the aural ice bag. Water at about 40° F. is placed in a container and fastened to the bed post or to an irrigating stand. A long piece of rubber tubing connects the ear coil on the patient's head. At the lower end of the coil is another piece of tubing which is connected to a receptacle on the floor. The water circulates through the coil and into the basin below. The flow is regulated by clamps, one on each tubing, similar to those used on the Murphy drip apparatus.

The chief advantage is that the temperature of the water may be maintained evenly. The clamps make it possible to turn off the solution as desired. A thin layer of bandage or gauze must cover the coil.

Carbolic Cap

Purpose—Treatment of pediculosis capitis. Ear patients with pediculosis capitis should have at least one treatment to kill the lice before operation, if possible. On account of bandages and dressings, post-operative treatment for this is not satisfactory.

Equipment—

Carbolic solution 1-40
Rubber cape
One 2 quart pitcher
One agate basin
One dressing towel for cap
One small towel to cover eyes.

Procedure—Pour into the pitcher one pint of 1-20 solution of carbolic acid and add one pint of hot water (making 1-40 solution). Protect the patient with a towel and a rubber apron and give him a small towel to hold to the eyes. Place a large solution basin on a chair in front of the patient. Pour the carbolic solution over the hair allowing it to drain into the basin. This solution is then turned back into the pitcher and poured over the hair again, repeating the procedure three or four times, depending upon the thickness of the hair.

The hair is then allowed to drip for a few minutes over the basin after which it is tied up in a towel for one hour. Shake, dry the hair, and comb with a fine tooth comb to remove the dead lice.

The carbolic treatment of course, merely kills the lice and thorough fine tooth combing is necessary to remove the nits.

Removal of Nits

Equipment—Derbac soap and Derbac comb.

Procedure—This is the most satisfactory method of removing nits. Shampoo the hair allowing the thick lather to remain for five minutes. Rinse thoroughly and use the fine tooth comb, taking a few strands of hair at a time. It is usually necessary to repeat this treatment several successive days in order to rid the hair of nits entirely.

If the ear conditions contraindicate further treatment, keep on the carbolic cap until the treatment is possible.

CHAPTER XVI

NURSING CARE IN DISEASES OF THE EXTERNAL, MIDDLE AND INTERNAL EAR

External Ear Diseases

Furunculosis of the External Auditory Canal

Etiology—It is associated with debilitation, chronic eczema or trauma. The staphylococcus is frequently the causative organism. It may be circumscript or diffuse.

Symptoms—There is severe pain in the ear, redness and swelling, frequently to the extent of closing the canal. Occasionally the swelling extends to the preauricular area or to the mastoid region, but this should not be mistaken for mastoiditis. Pain upon moving the auricle is the most characteristic sign of furunculosis, although both may be present simultaneously. There may be general malaise due to loss of sleep, from pain.

Treatment—Apply heat to localize the infection. Apply hot saline irrigations and flaxseed poultices every three hours. Protect the skin with vaseline to prevent irritation. After the furuncle discharges (either spontaneously or by incision) irrigations may be continued or alcohol wicks used to prevent infection. Build up the general health, treat any local or general condition, and apply if possible some form of light therapy, sunshine, Alpine lamp, quartz light, or X-Ray.

Herpes Zoster (Shingles)

A disease of the auricle and external auditory canal characterized by the formation of vessicles.

Etiology—The etiology is unknown. It is associated however, with irritation of the geniculate ganglion.

Symptoms—There is a prodromal stage of pain, with burning and tingling of the ear followed by the appearance of vessicles from infection. Ointment in some form is prescribed with drugs to control the pain.

Hematoma of the Auricle (Cauliflower Ear)

A swelling of the auricle due to an effusion of blood between the cartilage and perichondrium commonly seen in boxers.

Etiology—Trauma.

Symptoms—A generalized swelling, bluish in color, and pain mark the onset.

Treatment—If the swelling is slight, the hematoma usually disappears. Large hematomatae are incised, the clot curetted out, and the wound packed with iodoform gauze. A pressure bandage must be used to reduce the swelling and to prevent the formation of another clot. The usual complication is perichondritis. Once this develops the cartilage sloughs; the excision therefore must be made under the best possible aseptic conditions.

Perichondritis

This is marked by a separation of the perichondrium from the cartilage, with an effusion of pus and serum.

Etiology—Trauma is the immediate cause which is then followed by infection. It sometimes occurs after excision of a hematoma.

Symptoms—The first sign is a dark red spot which becomes tense, swollen and very painful.

Treatment—If the fluid is serous, the condition will subside without interference, but if it is pus, incision is necessary to establish drainage. Apply a pressure bandage to reduce the swelling and to prevent recurrence.

Otomycosis

This is an inflammation of the external auditory canal due to the fungus, Aspergillus niger, Aspergillus fumigatus, or Aspergillus flavus. It occurs frequently among people living in damp climates or in houses poorly ventilated, as dampness is essential to the growth of fungi.

The symptoms are a local skin irritation of the external auditory canal with itching, burning, and pain. In severe cases the canal is filled and there is deafness and tinnitus. The Aspergillus niger and fumigatus varieties have a blackish cast while the Aspergillus flavus appears yellowish.

Treatment—Dryness is the most important factor in the treatment. Clean out the canal with warm alcohol and 2% salicylic acid, and then fill it with boric acid powder.

Malignancy of the Auricle and External Auditory Canal

The most common is epitheloma. This occurs rarely and in the early stage is usually mistaken for granulation tissue. The symptoms are variable. Headaches are the most constant symptom.

Treatment—Excision should be done if possible. If this is inadvisable, x-ray or radium treatment is indicated.

Malformations of the Auricle

Absence of the auricle, undeveloped auricle microtia, excessive development macrotia, or polyotia development of two auricles, and malformations of different portions of

the ear such as the lobe, the helix, etc., can occur. The treatment is surgical and may involve a plastic operation.

Auditory Canal

Atresia is a congenital or acquired closure of the canal. Exostosis, an enlargement or thickening of the bone of the canal wall, is not uncommon. The treatment is surgical.

Erysipelas

Erysipelas of the ear is usually secondary to operation or chronic ear disease manifesting itself by pain, redness, and swelling of the affected parts. Marked elevation of temperature is the rule.

Etiology—The etiology is unknown but it is thought to be associated with a streptococcic infection.

Symptoms—A definite line of demarcation between the normal and abnormal area is diagnostic. The skin has a characteristic shiny red-bronze appearance with blebs. There is a marked rise in temperature, pain and general malaise. In severe cases, as the temperature rises, the patient becomes irrational.

Treatment—The efficacy of local treatment is doubtful although hot or cold compresses of saline, or Epsom salts may give marked relief. The demarcated area may be painted with flexible collodion or tincture of iodine in an attempt to wall off the infection. Icthyol and boric acid ointments are standard remedies. At the present time vaccines are being used, although not in all cases satisfactorily.

It is usually a self-limiting infection but may spread over an extensive area. Use boric acid ointment if the eye is involved.

Observe strict precautions. Nurses should wear a gown. All waste material should be contained in paper bags and burned, and the bed linen treated as for any precaution case. Place a basin of corrosive sublimate 1-1000 in the room in which to dip the hands after contact with the patient. The diet consists of fluids until the acute condition subsides.

Male patients must not be shaven until precautions are no longer necessary or approximately two weeks after the temperature is normal. This of course is determined by the doctor.

Frost Bite of the Auricle

Etiology—Exposure to cold or prolonged application of iced compresses will cause frost bite.

Treatment—The main factor in the treatment is the restoration of the circulation and the prevention thereby of complications such as perichondritis and gangrene. Apply friction to the ear, first with cold, either snow or cold water, and as the circulation is reestablished apply warm water. Ordinarily this condition clears up without complications, although the ear is apt to be sensitive to cold for some time afterwards.

Eczema

Eczema is an acute or chronic condition of the skin occurring in three stages, erythematous, vessicular, and crusting.

Etiology—It is unknown but predisposing factors are debilitation and constipation. It is also associated with irritation and caused by chronic discharging ears.

Symptoms—In the acute stage the ear is swollen and red with constant burning and itching. Vessicles appear which weep profusely but ultimately dry and form scales or crusts.

If the auditory canal is filled with discharge, the hearing is impaired.

Treatment—Special attention to the general health is important. Locally zinc oxide ointment applied to the area will relieve irritation. In chronic cases tannic acid and vaseline ointment is effective. Children must be prevented from picking or scratching the ear, therefore cuffs should be applied.

Removal of Aural Foreign Bodies

In childhood the ear appears to be a convenient storage place for a variety of foreign bodies ranging from shoe buttons to beans, peas, pieces of glass, chalk, beads, etc. Unskilled attempts to remove these is very often the cause of severe lacerations of the canal or drum and occasionally forcing the foreign body into the middle ear. Live insects may be drowned and floated out by irrigating the ear with water or oil. Maggots may be killed by a few drops of chloroform or ether, and then removed with forceps. Peas and beans in the ear should never be irrigated as watery solution makes them swell. A few drops of alcohol or ether will cause dehydration and facilitate the removal of vegetable foreign bodies.

Beads—they are very difficult to remove and require an aurist. The smooth surface makes a bead difficult to grasp, consequently it is very easy to push it through the drum into the middle ear cavity. If this occurs an ossiculectomy or mastoidectomy is necessary to remove it. Irrigations to float out the bead are not very successful, particularly if the bead is wedged in tightly, as is usually the case.

Injuries of the Drum Membrane

Injuries to the drum membrane are caused by penetrating foreign bodies, twigs, toothpicks, hairpins, etc. Rupture of the drum may be caused by an explosion, a fractured skull, a blow on the ear, and an inflammation of an abnormally thin drum.

Treatment—Nurses are not authorized to institute treatment of any kind until the patient has been examined by an aurist. Never irrigate the ears for purulent or bloody discharge, without the doctor's orders. Insertion of a sterile wick into the canal is permissible.

Deaf Mutism and Education of the Hard of Hearing

Deaf mutism may be acquired or congenital. In the acquired form infectious diseases as scarlet fever, measles, and meningitis are common causes. Consanguinous marriages and heredity are predisposing factors in the congenital form.

It is impossible to determine the deaf mutism of the child until about one year of age.

The prognosis is more favorable in the congenital form than in the acquired form (Bacon), but in either case it is not favorable.

Treatment—This depends upon early education of the patient. The oral or German method of lip reading is considered the best.

The patient must possess average intelligence, normal vocal cords, and be seven years of age or more before he is eligible for instruction. Instruction is begun by teaching the patient all the sounds necessary for the language, how to form the words, and finally the meaning. This is conplaced on the facial expression in conjunction with the move-

veyed in the form of pictures, models, etc. Emphasis is also ments of the lips. Movements of head, brows and expression in the eyes are of significance and the pupils are instructed accordingly.

The French system is another method of educating deaf mutes, but it is used less frequently. With this method the finger alphabet is combined with gestures or signs.

Oral schools are maintained by all of the States over the country. In the State of Massachusetts, for example, many schools of this kind under the direction of the Public School System, are available for adults. In other localities Hard of Hearing Associations function in the same capacity, arranging lectures and various social activities which are tremendously enjoyed by the deaf.

Among the most important schools for the deaf in the State of Massachusetts are the Horace Mann School in Boston, the Clark School in Northampton, and the Beverly School for the Deaf in Beverly.

In any of these schools deaf children from six years of age and up are eligible for lip reading education. Through the Board of Education an application is sent to the superintendent of schools and to the governor of the state who signs the application. Arrangements are then made for the pupil to be sent to the school nearest his residence. At Hartford, Connecticut, the American School for the Deaf prepares its students to become teachers in this particular field. This school, incidentally, was one of the first schools of its kind to be established in the United States.

Detection of Hearing Defects

The importance of determining deafness and subsequently the necessity of lip reading among school children is be-

ing recognized more as time goes on. Educational departments throughout the country are appropriating funds to maintain schools for the education of the deaf. An article written by Emily Pratt, M.D., in the October number of the Volta Review states that "prevention of deafness should be the aim of all interested in the health of school children. Hand in hand with this should be the provision of special educational instruction for those who may need a crutch to lean on. We can eradicate diphtheria but as yet no such measure exists for the elimination of deafness. Until such time we must search out the deaf child and provide for him. It is the responsibility of all Boards of Education."

To facilitate the detection of hearing defects a phono-audiometer is used. This is an instrument producing sounds of any pitch and intensity and with it the whole range of audibility can be explored and the audibility curve constructed.

The nurse is only indirectly connected with this particular field of work, but it is most necessary that she should know that there are various organizations for the deaf in order to refer to them patients who are in need of such education.

Middle Ear Diseases

Disease of the middle ear can be classified as suppurative and non-suppurative. Under the suppurative type it is important to differentiate the terms acute and chronic; an ear discharging up to eight weeks is classified as an acute type, from eight to ten weeks or longer, as a chronic.

Acute Otitis Media
Acute Suppurative Otitis Media

This is an acute inflammation of the mucous membrane of the middle ear characterized by pain, tinnitus and deafness.

Etiology—It follows acute infections such as measles, influenza, pneumonia, typhoid, scarlet fever, or other conditions.

Symptoms—Objectively, there is a red and bulging drum, subjectively, pain, deafness, and tinnitus and usually a rise in temperature, higher in children. With the majority of acute ears there is an acute mastoiditis, which subsides in two or three days.

Treatment—Apply heat to the drum membrane by means of hot saline irrigations. Continue the treatment until the membrane is ready for incision, or to rupture spontaneously. The effect of heat is soothing to the patient. During the acute stage sedatives such as veronal or aspirin are necessary to allay the pain.

Aural Paracentesis

An incision of the drum membrane to evacuate the serum or pus from the middle ear is often necessary. The canal is sterilized with 50% alcohol to prevent secondary infection. The patient is given an anesthetic, gas, ether, or local anesthesia.

Treatment—This depends somewhat upon the type of discharge found. If serum is found, dry wipes are used; if pus is found, dry wipes and saline irrigations are very effective. Wash off the skin frequently around the anterior part of the canal with half strength peroxide to guard against eczema. The systemic treatment is important, rest in bed, force fluids, light diet, etc. A hot water bag or ice bag as desired may be applied over the ear when the post aural pain is severe.

Complications—Mastoiditis is the most common complication. The prodromal period is usually 2-3 weeks. Fol-

lowing very severe infections such as scarlet fever or pneumonia, the cell destruction may take place in less than a week or even in a few days.

Mastoiditis

Mastoiditis is an inflammation of the mastoid cells.

Symptoms—Subjectively, there are headaches in the region adjacent to the affected ear, pain of throbbing character, worse at night with an elevation of temperature.

Objectively, there is post aural oedema, tenderness over the antrum or tip of the mastoid, and a drooping of the postro-superior canal wall. An x-ray will usually show after two and a half to three weeks an area of cell destruction.

In children, mastoid infections show few symptoms with the exception of a post aural abscess. Pressure from within the antrum breaks through the cortex to produce an abscess beneath the periosteum. This pushes the ear forward and outward.

Treatment

Abortive—Apply an ice bag to the mastoid.

Surgical—After the bony destruction has taken place, a simple mastoid is indicated.

Technique of the Mastoid (Simple)

An elliptical incision about one-fourth inch back from the auricle is made, starting above the upper margin of the superior canal wall, and being carried down to the tip. This incision is carried through skin and periosteum to the bone. The periosteum is elevated from the bone, exposing the posterior wall of the external auditory canal and the spine of Henley. The cortex is removed with a gauge, starting slightly above the spine following the direction of the canal

wall, towards the tip. The antrum is then located and enlarged. It is anatomically situated beneath the spine, slightly forward and upward. Starting from the antrum, the cells are opened in the direction of the zygoma through the posterior wall cells and tip cells. This procedure permits opening of the sinus cells last, and in case the sinus is punctured, the operation can be considered completed. The cells in the region of the sinus are thoroughly explored, as destruction most commonly takes place at this point and infection from here can invade the lateral sinus.

An iodoform wick is placed in the antrum and the post aural wound closed with two or three silk worm gut sutures.

Post-Operative Treatment—It is most imperative to observe all mastoid cases for complications such as meningitis and sinus thrombosis. Signs of meningitis are a stiff neck and sudden rise in temperature, and that of sinus thrombosis the characteristic septic or "picket-fence" temperature. Turn the patient frequently, giving special care to the back and bony prominences.

The diet consists of liquids without milk as long as nausea persists, followed by soft solids unless there is a rise in temperature.

Keep the patient at least one week in bed, or until the temperature is flat. On the third day a back rest may be given and in another four or five days the patient is allowed out of bed. The temperature should be watched carefully, and the patient put to bed at the slightest elevation.

Usually the sutures (if of silk) are removed on the fourth day. If the discharge diminishes and the wound heals normally, a cocoon dressing of cotton and collodion can be substituted for the bandage.

Complications of Mastoiditis

Lateral sinus thrombosis is perhaps the most common complication. Infection spreads from the mastoid to the lateral sinus, producing an infected clot or thrombus. This produces a general septicemia unless something is done at once to check the spread of infection.

Sinus Thrombosis

Symptoms—Sinus thrombosis is usually ushered in by a chill and a sudden rise in temperature as high as 104-105 with a corresponding rise in pulse. The temperature chart shows a sharp rise and then an equally marked fall; this cycle continues daily. There is marked prostration. Other common symptoms are tenderness along the anterior border of the sterno-cleido-mastoid muscle in the neck, and oedema of the veins over the mastoid. A blood culture is taken to determine the organism. Streptococcus, staphylococcus, and the pneumococcus are the organisms most commonly found. Streptococci infection is extremely serious.

The monometer test as devised by Dr. James Ayer can be applied. A lumbar puncture is done and a monometer tube is attached to a three-way cock, connecting with the lumbar puncture needle. To test for the presence of a suspected thrombus, the initial pressure is taken and then both internal jugulars are pressed, causing the fluid to rise to a high level in the tube; the side suspected of infection is then released and if the fluid does not descend, the test is said to be positive. If the fluid descends slowly, a mural thrombus is suspected. Error in the test can be caused by a difference in size of the internal jugulars.

Surgical procedure may be resorted to in an endeavor to remove the thrombus.

Technique of Jugular Ligation

A two-inch incision along the anterior border of the sterno-cleido-mastoid muscle is made at the level of the thyroid cartilage. The carotid sheath is identified and opened. The internal jugular vein is freed by blunt dissection from the external carotid artery and the vagus nerve. The jugular is ligated in two places with chromic catgut. The muscle is united with catgut and the skin incision closed with silk. A small rubber tissue drain is inserted in the lower end of the wound.

With the tenderness and stiffness of the neck which is invariably present, there is a great tendency for the patient to lie in one position. The nurse should change the position frequently. Bathe and powder the back, buttocks, and elbows to avoid pressure sores.

The diet should consist of fluids enforced as long as there is temperature. The length of time the patient stays in bed depends upon clinical signs. Watch for signs of complications such as meningitis.

Meningitis

Meningitis, usually a fatal complication, may be a direct infection from the mastoid. It is occasionally induced by operation, if the dura is punctured.

Symptoms—Rigidity of the neck and a positive Köernig sign are early indications. Lumbar puncture discloses a cloudy spinal fluid with a high cell count. High temperature, accelerated pulse, and severe headache are also characteristic. There is later a marked opisthotonos.

Treatment—The treatment of meningitis is unsuccessful. Temporary improvement is obtained by daily lumbar punctures to relieve the cerebral pressure, which affects especially

the cardiac and respiratory centers. Force fluids as much as possible. Care of the back is of great importance. The prognosis for recovery is practically nil.

Labyrinthitis

Labyrinthitis is secondary to suppuration in the middle ear.

Types—Labyrinthitis occurs in two forms, serous and purulent. In serous labyrinthitis there is marked dizziness, nausea, and vomiting, but no temperature. It ordinarily clears up without complications and the patient recovers.

In the purulent type the symptoms are more severe, with nausea, vomiting, ataxia, nystagmus, and vertigo, impaired hearing, and an elevation in temperature. Intracranial complication is frequent. In this form the prognosis is poor; if recovery does occur, there will be a dead labyrinth.

Treatment—Surgery is not indicated in these cases, the treatment, therefore, consists of absolute rest in bed, force fluids, light diet, catharsis, etc.

Bezold's Abscess

A mastoid infection, breaking through the mastoid tip, produces an abscess in the neck, known as Bezold's Abscess.

Treatment—A simple mastoid is done and the abscess in the neck incised. A wick is inserted in the cervical abscess to promote free drainage.

Gradenigro's Syndrome Complex

The result of mastoid infection extending to the apex of the petrous portion of the temporal bone gives Gradenigro's Syndrome Complex.

Symptoms—The symptoms are facial neuralgia, eye pain, severe frontal headaches and sixth nerve palsey. Malignancy

of the posterior ethmoid and sphenoid sinuses will produce the same symptoms.

Treatment—Surgical—A simple mastoidectomy usually clears up the condition. The nursing care is the same as for a simple mastoid.

Chronic Suppurative Otitis Media

An ear discharging for ten weeks or longer is called chronic.

Symptoms—The symptoms are deafness, foul discharge, tinnitus, vertigo, headaches, nausea, and vomiting. A chronic suppurative ear may show upon X-Ray a cavity filled with cholesteatoma (composed of cholesterin crystals and epithelial debris and having the power to destroy bone), or more frequently a sclerosed mastoid. When the headaches are severe and the patient complains of dizziness, with poor hearing, a radical mastoid is indicated.

Other Indications for Radical Mastoid

1. To prevent intracranial infection.
2. To lessen the discharge and odor.
3. To preserve hearing.
4. Facial paralysis.
5. Exploration for brain abscess.

In the radical operation, the partition separating the middle ear cavity and the mastoid cavity is removed, making it into one large cavity.

Technique of the Radical Mastoid

There are various methods. One of these is to do a simple mastoid first, then carefully remove the partition separating the middle ear cavity from the mastoid cavity. This procedure requires removal of the bone covering the facial nerve as completely as possible. The bridge of the aditus is

removed and the superior attachment of the bone which covers the dura is thinned out to its fullest extent. The malleous and incus if present are removed. The stapes is always left. Granulations in the middle ear are removed very gently. The cartilage of the posterior canal wall is split either in the shape of a "V" or a "T". This enlarges the external auditory canal to at least twice its original diameter. The canal flaps must be held in place by sutures. The final step in the operation is to put a skin graft, taken from the thigh, into the radical cavity and pack it tightly with iodoform gauze. The iodoform packing is separated from the skin graft by crêpe de lisse. The post aural wound is closed tightly, usually with metal skin clips.

Complications of Chronic Suppurative Otitis Media

Sinus thrombosis, meningitis, labyrinthitis, facial paralysis, brain abscess, erysipelas, and perichondritis are among the most important complications; the first three have been taken up as complications of acute suppurative otitis media.

Facial Paralysis

Etiology—The 5 common causes of the disease are:

1. Injury to facial nerve during operation.
2. Packing, that is tight, following radical mastoid.
3. Pressure from cholesteatoma following erosion of the facial canal.
4. T. B. mastoiditis with sequestrum (fragment of necrosed bone).
5. Peripheral neuritis, or Bell's Palsey.

Treatment—If the paralysis is due to the second, third, or fourth cause, the condition usually clears up with the removal of the cause. If the nerve has been completely

severed, surgical anastamosis of the descending hypoglossal or the spinal accessory nerves can be tried to restore the function of the facial.

Brain Abscess

Secondary to chronic otitis media and mastoiditis a brain abscess may remain latent for many years. Probably this is the most common mode of infection. The dura in contact with the pus becomes inflamed and necrosis results. This process continues until a pathway is established from the mastoid forming a stalk or pedicle leading directly into the brain. Brain abscesses vary according to size and location.

Symptoms—Severe deep seated headaches usually worse at night, a characteristically slow pulse, aphasia (motor and sensory) incoordination, choked disc, projectile vomiting, restlessness and insomnia are characteristic symptoms. There is a rise in temperature at the onset, returning to normal or thereabouts as the disease progresses.

Treatment—The abscess may be approached either through the mastoid or subtemporal region. The Mosher basket has been used very successfully at the Massachusetts Eye and Ear Infirmary to drain the abscess, once it has been located.

Nursing Care

Careful observation for complications such as meningitis, with special attention to the general comfort of the patient, is essential and absolute quiet is of great importance.

Internal Ear Diseases

Meniere's Disease

Etiology—Hemorrhage into the labyrinth is the immediate cause.

Predisposing causes—Nephritis, anaemia, exposure to

heat, and labyrinthine lesions are thought to be predisposing factors.

The symptoms are deafness, marked dizziness, nausea, projectile vomiting, and tinnitus.

Treatment—Patients with this condition should be put to bed as long as the dizziness persists. Treat the cause if possible. General systemic treatment is important, liquid diet and catharsis to promote elimination.

Non-Suppurative Ear Diseases

Under this heading are the secretory forms of otitis media, otosclerosis, and nerve deafness.

Acute Secretory Otitis Media

Etiology—Any condition producing an acute rhinitis may induce it.

Symptoms—Deafness and tinnitus.

Treatment—Catheterization and inflation of the Eustachian tubes will give immediate relief, as the condition is due to a closure of the Eustachian tube. If fluid is present a puncture of the drum is necessary to relieve the condition.

Chronic Secretory Otitis Media

Treatment for these cases is similar to that used in the acute form, but it is usually only partially successful and in many instances entirely ineffective. This condition produces the largest group of deafness.

Otosclerosis is defined as the condition in which the bony capsule surrounding the labyrinth is the seat of a chronic non-suppurating disease interfering with the function of hearing.

Etiology—Although the cause is unknown, heredity appears to be the most important factor. It is essentially a dis-

ease of the young adult, usually appearing between the ages of twenty and thirty.

Symptoms—There are two characteristic symptoms, a gradually increasing deafness and tinnitus. Hearing test shows a markedly prolonged bone condition.

Treatment—Treatment is unsuccessful at present. Any possible focus of infection should be corrected. The patient should be encouraged and advised to take up lip reading before the deafness becomes marked.

Nerve Deafness

Etiology—Common causes are Lues, acute infections, i. e., measles, mumps, typhoid, etc., cardio-vascular diseases, toxemias, such as lead, alcohol, tobacco, salicylates, quinine, etc., Leukemias, and Meniere's disease.

Symptoms—The bone conduction is much lowered or is absent.

Treatment—The source of infection should be determined if possible, and the cause removed.

The prognosis for improved hearing for these patients is very poor. Lip reading is a great aid.

CHAPTER XVII

EAR PREPARATIONS—SURGICAL TECHNIQUE

The local preparation of the ear for an external ear operation is, as a rule, an important procedure. A scrub of soap, water, and alcohol is followed by the application of a sterile dressing and a bandage. Hematomata, furuncles of the auricle, and perichondritis are prepared in this manner.

Aural Polyps

A local preparation is unnecessary. Give a saline irrigation if the discharge is profuse.

Furuncles of the Canal

Swab out the external auditory canal with 50% alcohol and insert a sterile wick before the incision is made.

Mastoid Preparation

Equipment—

6 solution bowls	1 razor, straight or safety
Soap solution	Sterile wicks
Sterile water	Adhesive
Alcohol 50%	Red crayon or pencil
Waste basin	Bandage
Sterile pledgets	Operation slips
1 package sterile gauze	1 pair sharp straight scissors

Pre-Operative Preparation

Give the patient a shampoo and a bath the night before, if possible. The patient may have a light supper, no breakfast. Fluids can be given during the night. In the morning a soap suds enema is given. Send a specimen of urine to the laboratory for examination.

Local Preparation

The preparation of radical and of simple mastoids are the same with the exception that the area in the former is about ½ inch wider and no irrigation is given.

Simple Preparation (Female)

Protect the neck and shoulders with a towel and cape, part the hair in the middle and braid it on the unprepared side. Dry wipe and irrigate the ear, dry it out carefully and insert a sterile wick. The wick prevents hair from getting into the canal during the hair cutting.

From the center of the head part off a forelock in front of the ear. This is brushed over to the other side of the head and braided. After the operated area has healed, this forelock is brought down over the ear concealing the post aural scar. Part the hair over the ear in a crescent about two inches above and in back of the auricle. Cut off only the strands of hair in the area of operation and so that the smallest amount is removed. Never cut the patient's hair against his or her wishes. Bobbed hair should be braided as much as possible, cutting off the hair in the manner described above. The hair should be cut as closely to the scalp as possible. The area is then shaved.

Collodion Strip

To protect the hair around the area of operation apply a collodion strip. This consists of a single layer of gauze folded diagonally. It is molded to the outer margin of the prepared area. At least two strips will be necessary to complete the outlined edge. Paint the edges of the gauze with flexible collodion until it is firmly adherent to the hair and skin. Protect the eyes of the patient with gauze during this

procedure. In some hospitals adhesive strips are used in preference to collodion, but they are difficult to remove.

After the application of the collodion strip the external scrub is done. This is not a sterile procedure but the hands should be scrubbed thoroughly. Beginning with soap solution, the area of operation is scrubbed thoroughly including the front of the auricle. Wipe off with sterile water and then with alcohol. Particular attention should be given to the auricle. Its many crevices serve as excellent hiding places for infection. Clean these out with toothpick swabs dipped in soap and alcohol.

Dressings

The thickness of the post aural dressing depends upon the amount of oedema. If it is marked, use seven or eight thicknesses of gauze. This is folded on the bias, or diagonally, the long edge of which is placed as close to the auricle as possible. This acts as a cushion, relieving the pressure on the auricle as the bandage is applied. Cover the first dressing with a flat dressing of gauze. The preparation is completed with the application of the bandage and by marking the face on the affected side with a red pencil.

Simple Preparation (Male)

This preparation is the same as for female patients with the exception of the collodion strip although occasionally it may be necessary to use the strip when the hair is extremely thick and bushy.

Radical Mastoid

The radical mastoid preparation is similar to the simple type with exception of the irrigation, which is omitted. Area —Cut and shave the hair about three inches above and in back of the auricle.

Skin Grafts

Skin grafts are used following radical mastoids. Put the patient to bed, protecting with rubber sheeting. The thigh opposite the ear prepared is used and the area from the groin to the knee is shaved. The skin for the graft is taken from the inner surface of the thigh. It should be shaved very carefully, scrubbed with soap and water and with alcohol, and then covered with a sterile towel. This is wrapped tightly about the thigh and bandaged securely. Strips of adhesive are placed vertically on to the skin in several places to prevent the dressing from slipping Following all preparations, equipment should be replaced.

Jugular Ligation

This operation is done in the surgical treatment of lateral sinus thrombosis.

Equipment—The same as that for a simple mastoid.

Procedure—Shave the area from the posterior to the anterior mid-line of the neck as far down as the clavicles. Scrub thoroughly with soap and water and then with alcohol. Cover with a sterile towel. The towel is held in place by a bandage circling about the neck several times and down under each arm. Fasten the bandage with adhesive.

Exploration for Brain Abscess

Equipment—A tray containing—

Rubber cape	One waste basin
Towel	Sterile cotton
Four solution bowls	Sterile gauze
Soap, water, and alcohol	Bandage and adhesive

Straight or safety razor

The preparation is made with the patient in bed. Protect the shoulders and neck with a rubber cape and a towel.

Area—The hair is cut off on the posterior two thirds of

the affected side. Cut it as closely as possible and shave. Following the shave, the area is scrubbed with soap and water and then with alcohol, and a sterile towel or gauze dressing applied. Over this apply a Mellon bandage.

The Operating Room

Instrument Sets—For a mastoid operation the following instruments are used; the list is of course subject to change according to the wishes of the surgeon. The skin is prepared with iodine 3%, or mercurochrome 5 to 10%.

FIG. 20.—Ear Instruments (Mastoid Set).

Simple Mastoid

1 Scalpel
1 pair Mayo scissors
1 curved scissors
1 periosteum elevator (hoe shaped)
1 set of Blake curettes (sizes 3-4-5)
3 Jacks Mod. (different sizes)
1 set of Blake Gauges (sizes 5-7-9-11)
1 mallet (fibre)
1 centre edge chisel
1 White's Rongeur
1 C. & S. heavy Rongeur
6 hemostats
3 towel clips
2 Allport retractors
2 aural speculum
2 smooth forceps
2 tooth forceps
1 Hartman M. E. forcep
1 Hartman M. E. biting forcep (for radical)
1 M. E. angular forcep

1 searcher
1 silver probe
1 grooved director
1 M. E. probe
1 needle holder
2 curved cutting edge needles
5 strands silk worm gut
1 tube of No. 0 plain catgut
1 para knife

For the Radical Mastoid Operation add the folowing:

1 sharp canal knife
1 blunt canal knife
Right and left health retractor (one of each)
1 Yankaur probe
2 Kerrisons (small and medium)
1 Yankaur curette
1 Stacke brain protector
1 Hartman biting forcep

This is a maximum list and can be minimized to suit the surgeon.

Brain Abscess

Set the table as for a simple mastoid and add the following:

1 brain knife
1 brain director
1 straight ventricular probe
1 curved ventricular probe
2 Kerrison rongeurs (large and medium)
1 Hudson trephine with set of burrs
6 hemostats
3 towel clips
2 tooth forceps
2 smooth forceps
Brain drains (different sizes)
Eye needles (curved)
Black silk No. 4
Mastoid needles, catgut No. 0 silk worm gut
Rubber tubing for drain
Iodoform gauze

Metal syringe
Bone wax
Saline (hot)
Small cotton balls and sponges

The above list of instruments should be put on a separate table if a mastoid is to be done at the same time.

Lumbar puncture and monometer outfits may be used in brain operations.

Skin Graft

A skin graft is necessary following a radical mastoid to prevent the formation of granulations in the cavity. It may be done directly following the mastoid or at any time within a week thereafter, depending upon the condition of the cavity. A clean, granulating cavity, free from pus is necessary for the graft to take satisfactorily.

Skin Graft

1 medium Killian speculum
1 skin graft knife
2 dressing forceps
1 M. E. angular forcep
1 Hartman M. E. forcep
2 cotton applicators
1 scissors (straight)
1 large aural speculum
1 searcher
3 towel clips
1 oblong basin of sterile saline
1 oblong basin of alcohol (cotton in basin for knife)
2 pressure boards
2 throat sticks (sterile)
Sterile vaseline
Sterile cotton
Paraffin gauze
Perforated silk in corrosive sublimate 1-1000

If a primary graft is being done, a separate table is set up.

The head nurse should assist in the preparation of a

patient on the table, adjusting blankets, drapings, placing extra pillows or sand bags, elevating head, etc.

A scrub tray containing sterile soap, iodine 3%, or mercurochrome 5%, alcohol, and sponges should be prepared to use in case of poorly prepared areas or for more extensive preparations.

Duties of the Scrub Nurse

The scrub nurse should anticipate as much as possible the needs of the surgeon throughout the operation. Only by careful observation and good instruction is this possible. Among the first duties of the scrub nurse is threading the sutures and cutting the catgut into convenient lengths for ties and sutures. The threaded needles may be passed through several thicknesses of gauze or a towel until ready for use. Always hand them to the surgeon in the needle holder.

The instruments on the operating table should be kept clean and in order. Used sponges should be kept off the field of operation and operating table at all times, although they should not be removed carelessly or when their removal will cause any inconvenience to the surgeon. Instruments of one kind should be grouped together with handles directed toward the surgeon.

It may be necessary at times to hold retractors or assist in the operation. Following the operation, the scrub nurse assists with the dressing and application of the bandage. After the patient is removed from the operating room, scrub nurses should assist in picking up the room—clearing tables, washing instruments, etc., preparatory to the next operation.

Questions concerning the patient or the operation should be reserved until after the operation.

Jugular Ligation

Jugular set—

1 scalpel
2 hand retractors (smooth)
8 hemostats
2 tissue forceps
2 tooth forceps
1 probe
1 searcher
1 dissector
1 Mayo scissors (curved)
1 Mayo scissors (straight)
2 ligature carriers
4 strands silk worm gut
1 tube chromic catgut No. 1 and 2
1 tube plain catgut No. 1 and 0
Horsehair and straight needles

A separate table is set for the mastoid.

Duties of the Head Nurse

The duties of the head nurse are numerous and exacting. Everything must be in readiness to start the operation when the surgeon arrives. The operating room nurse is responsible for all operating procedures such as setting of tables, solutions and sterile supplies and in directing the student nurses.

The operating room should be kept quiet.

During the operation the head nurse should not leave the operating room unless absolutely necessary. The tables must be watched closely and kept supplied with necessary equipment, extra instruments, etc.

Instructions to scrub nurses are given by the head nurse.

Sterilization

Sterilization of articles used in the treatment of postoperative ear diseases must be done with the utmost care and precision.

Instruments

Sterilize by boiling 10 minutes. Scalpels and all non-boilable instruments are placed in alcohol 95% for 10 minutes before use.

Solutions

Sterilize in flasks for 45 minutes under 15 pounds pressure, moist steam.

Gloves

Wash off blood stains in cold soapy water. Tie the gloves securely in a piece of gauze or compress and boil for 15 minutes. Following the usual surgical scrub, the nurse should put on a sterile gown and gloves and sit before a sterile table to dry and powder the gloves.

Glove cases are done up in a package and are autoclaved for 45 minutes. The gloves, dried and powdered, are placed in these according to size.

Mastoid Dressing Sets—Equipment and Sterilization

Equipment—

1 pair straight scissors
1 angular forcep
1 plain forcep
1 probe
1 wire applicator
1 medium size ear speculum
2 packets of gauze 4 inches square, one of which has a 2 inch opening about one inch from one side through which to slip the auricle. The widest part of the gauze covers the post aural incision.
6 toothpick swabs
6 mastoid wicks
2 squares cotton

Procedure—Sterilize dry goods in the autoclave for 45 minutes under 15 pounds pressure.

Boil the instruments for 10 minutes, carefully open the sterile packages, and with a long sterile instrument place a set of instruments in each package. Drop the pins in alcohol before pinning the package together again.

Dressings—Nurses' Duties

Place a dressing set, sterile towel, a roll of bandage, and a pair of sterile gloves on each table of the bed patient. A drop light is necessary. The patient should lie on the unoperated side. Cut the bandage; remove all but the last layer of gauze over the mastoid wound.

Open up the sterile glove case, for the doctor to remove the gloves, and unpin the dressing set. He then spreads the towel over the patient's shoulder to furnish a sterile field for cotton, gauze, etc. Bandage the ear after the dressing has been finished and prepare the next case for the doctor.

Wash the instruments in cold water, scour, then boil and replace in the set again. Unused gauze, cotton, etc., may be saved and sterilized. A tray containing the following drugs and sterile goods should also be at hand.

- Flexible collodion
- Balsam Peru
- Canal mixture
- Aristol
- Alcohol
- Sterile cotton balls
- Swabs
- Iodine (tincture)
- Silver nitrate 10%
- Adrenalin
- Mercurochrome 2-5%
- Boric acid powder
- Iodoform gauze
- Mastoid wicks

CHAPTER XVIII

EAR CLINIC DUTIES

Preparing the patient for ear examination consists of removing hats, glasses, and any dressings. Push the hair of female patients back of the ears out of the way. Hand the patient's record to the doctor and listen attentively to the history. Watch the local examination carefully and support the patient's head if necessary. Keep fresh instruments and supplies on the table. Notice the treatment prescribed and be ready to explain in detail directions that are not clearly understood by the patient. Instructions in home treatment are very important, particularly ear irrigations followed by dry wipes. Usually instructions are given in making up a saline irrigation—(a teaspoonful of table salt to a quart of warm water). The small rubber bulb syringe has to be used, ordinarily, as irrigating equipment is not available in the home.

Barany Test

Barany tests are done in the clinic and students should be familiar in preparing the equipment used.

This test, as described by Barany of Vienna, is done to produce motion in the semicircular canals to determine the evidence of lesions in the labyrinth.

The Normal Reaction

In irrigating either ear on a person with normal labyrinths, with water of body temperature no subjective or objective

effects are produced. If water 68 degrees or lower is used, the following reactions are noticed: Rotary nystagmus moving away from the irrigated ear, marked disturbance of equilibrium and subjective vertigo. These reactions are quite invariable among normal individuals.

The Reaction in Disease

When the static labyrinth (vestibular apparatus) has been destroyed surgically or by disease, vestibular nerves can no longer respond to heat or cold stimuli, hence, the caloric reactions are absent. Normal cases should show nystagmus in 40 or 45 seconds. Nystagmus may be classified as slow or quick. Slow nystagmus is due to the endolymph in motion, while the quick is a result of cerebral reaction.

Equipment—

Barany chart
Barany chair
Rubber apron
Small rubber sheet
Irrigating can, tubing and tip
Irrigating stand
Bath thermometer
Water 68°
Receptacle for waste solution
Emesis basin
Pitcher
Rubber funnel with tubing connecting to catch the return flow
Ear speculum
Gauze
Towel

Set up a sterile table and arrange the instruments on it. Hot water of 112° may be used, but the reaction is just reversed. The nystagmus, for example, moves toward the irrigated ear.

Procedure—Seat the patient in the Barany chair and protect the neck and shoulders with a towel and a rubber cape. A rubber sheet should be draped around the patient for further protection. Place the rubber funnel below the lobe of the right ear, tying the tape which is attached to the funnel around the patient's head.

The nurse's duty may be either of the following: regulating the flow of the irrigation, or timing the nystagmus if the doctor wishes. The water is allowed to flow moderately into the ear through a speculum. At the first sign of nystagmus the irrigation is discontinued, and the nystagmus, vertigo, and past pointing charted. The patient may become nauseated.

The turning test follows. The patient is turned about 10 times sitting upright, and then the process repeated bending forward in order to stimulate the vertical and horizontal canals respectively. After this the nystagmus and past pointing are charted again.

Wipe out the ear thoroughly, then allow the patient to lie quietly for an hour. A few drops of aromatic spirits of ammonia on a cotton pledget held to the nose is effective in hastening the recovery. Call the ward nurse when a patient is ready to be sent back. Occasionally tests cannot be completed due to poor condition of the patient, making another appointment necessary.

Middle Ear Irrigations

Purpose—To remove cholesteatoma from the middle ear, and following ossiculectomy.

Equipment—

Middle ear syringe
Sterile cotton

Within

The nose is divided by a septum with two fossa, each composed of nine bones. The relation of these bones is the following:

Floor—Hard palate

Roof—2 nasal bones
Frontal (nasal portion)
Cribriform plate of the ethmoid
Body of sphenoid

Intranasal wall or *septum*—Composed of the perpendicular plate of ethmoid, the vomer, and the palatine process of the maxilla.

External wall—Three turbinates, superior, inferior, and middle, beneath each, a corresponding meati.

Vibrissae

These are tiny hair-like projections at the external nares, supposed to act as filters for the air.

Lining or Schneiderian Membrane

This is a mucous membrane lining, highly specialized, containing sebaceous glands and tiny hairs. It differs in character according to the functions of the part of the nose in which it is found. It has a columnar ciliated structure in the respiratory region; in the olfactory region the epithelial cells are columnar but non-ciliated. It is yellowish in color and contains the end organs of smell.

Septum

The septum, or intranasal wall, which is the partition between the two nasal cavities, is quadrilateral in shape. It is composed of three bones, the perpendicular plate of the

ethmoid, the vomer, and the palatine process of the maxilla.

Blood Supply

The rich blood of the nose is derived chiefly from branches of the ophthalmic artery (anterior and posterior ethmoidal branches) and the sphenopalatine branch of the internal maxillary artery.

Turbinates

There are three in number, the superior, the middle, and the inferior. Chiefly composed of cartilage, these scroll-like structures assist in forming the lateral walls. Below each turbinate are the corresponding meati, openings through which drain the various sinuses, the superior meatus draining through the posterior ethmoid cells, the inferior meatus through the naso-lacrimal duct. The remaining sinuses, the antra, frontals, anterior ethmoid cells, and the sphenoids drain through the middle meatus.

ACCESSORY SINUSES

Frontal — Sphenoidal
Ethmoidal (Posterior and Anterior) — Maxillary

The sinuses are openings or cavities of varying size in the skull. They are lined with mucous membrane continuous with that of the respiratory tract.

Function

The sinuses are thought to play an important part in the resonance of the voice. They also help to lighten the bones of the skull.

Frontal

These are located in the anterior portion of the frontal

bone. They are usually absent at birth and do not reach their full development until puberty.

A septum or partition divides the frontal sinus. With a deviation of this septum, the cavities are irregularly divided and occasionally a sub-division of each cavity is seen.

Maxillary Sinus or Antrum of Highmore

The antra are usually the largest sinuses. They are situated in the superior maxillary bones, below the orbit and on either side of the nose. Their roofs form the floors of the orbits. They are roughly pyramidal in shape with the apices directed toward the nose.

Ethmoidal Cells

There are two groups, the anterior and posterior.

Anterior Ethmoids

These are situated in the upper part of the nasal cavity, directly in back of the frontal sinuses. These cells are the smaller of the two groups, usually numbering six to eight.

Posterior Ethmoids

These are larger than the anterior cells, numbering three or four, and are situated back of the anterior group.

Sphenoid Sinus

These sinuses, two in number, are next in size to the antra. They are situated in the body of the sphenoid bone, posterior to the ethmoid cells.

Mouth or Buccal Cavity

The structure of the mouth is as follows:

Roof—The roof of the mouth is composed of the hard and the soft palate, or uvula.

Floor—The floor is composed of the palatal processes of the superior maxilla, palatal bones and the tongue.

Lateral Structure—The cheeks and the teeth form the lateral walls or structure of the buccal cavity.

Tonsils

These are oval-shaped structures, composed of lymphoid tissue, enclosed within a thin capsule or membrane. They are situated between the pillars of the fauces and normally project slightly outside on either side of the throat.

Function

The function of the tonsils cannot be definitely stated although it is thought to be the same as that of lymphoid tissue elsewhere in the body, namely, to act as filters and to assist in fighting infection.

Adenoids

The adenoids are composed of the same tissue as the tonsils. They are situated in the vault of the nasopharynx, and are sometimes spoken of as the nasopharyngeal tonsils. The adenoids, in contrast to the usual belief, are normal tissue and not until they become hypertrophied are they harmful.

Pharynx

The pharynx is the connecting link between the posterior nares, the mouth and the larynx. It extends from the base of the skull to the esophagus below. There are seven openings into the pharynx,—two posterior nares, two Eustachian tubes, the mouth, the larynx, and the esophagus.

The pharynx is divided into 3 divisions—

1. The nasopharynx in which are found the adenoids, and the Eustachian tube orifices.
2. The orthopharynx which contains the tonsils.
3. The laryngopharynx below the orthopharynx.

Larynx or Voice Box

Below the pharynx is the larynx, extending from the top of the epiglottis to the lower edge of the cricoid cartilage. It is composed of 9 cartilages. The largest and most important of these cartilages is the thyroid. It consists of two broad pieces of cartilage, the anterior borders of which fuse to form the prominence on the neck known as "Adam's apple."

The anterior wall of the thyroid serves as a point of attachment for the vocal cords. Next in size and importance is the cricoid, thicker and stronger than the thyroid, which gives support to all of the other cartilages of the larynx. This forms the lower posterior walls of the larynx. The lower border of the cricoid is horizontal and is connected to the highest ring of the trachea.

The third important cartilage is the epiglottis, a thin lamella of fibrocartilage, yellowish in color, and leaf shaped. It projects obliquely upward, behind the root of the tongue and in front of the entrance to the larynx. Its function is to close over and protect the opening into the larynx during the process of deglutition.

Attached to the upper border of the cricoid cartilage, on the posterior wall of the larynx, are two pairs of small cartilages known as the arytenoids. These are important, as they serve as points of attachment for the muscles and the vocal cords.

The corniculate cartilages consist of two small nodules, articulating with the summits of the arytenoids.

In front of the arytenoids there are two small elongated cartilages known as the cuneiforms.

Vocal Cords

The vocal cords located in the larynx consist of strong bands of yellowish elastic tissue covered with mucous membrane closely adherent. There are two sets of cords, the true and the false. The false cords are above the true ones with a space called the ventricle between. In man they have no known function.

The true cords are two in number and are about one-half inch long in the female and about three-fourths inch long in the male. Anteriorly they are attached to the thyroid cartilage and posteriorly to the arytenoids.

The Mechanism of the Voice

The vocal cords are the primary organs of the voice. The air, as it is exhaled from the lungs, passes through the opening between the cords. When these cords are taut the escaping air causes them to vibrate which in turn produces the voice. The tension or tautness of the cords controls the pitch of the sound, the greater the tension, the higher the pitch.

The vibrations arising from the vocal cords are reenforced or resonated by the column of air in the larynx and by the air in the pharynx, the nasal and buccal cavities. In addition to these, the sinuses tend to resonance giving a richer quality to the tone.

The sound which is produced in this way is broken up and consciously modulated by the use of the tongue, the teeth and the lips, giving us speech.

Many factors enter into determining the quality or timbre of a voice—the anatomical elements, the size and individual variations of the larynx, cords, pharynx, nasal and buccal cavities, as well as the ability to coordinate the

muscular action of these parts. The variations of the qualities of the voice are endless, as the voice so readily follows the mind, giving subtleties and nuances to the spoken word.

Trachea

The trachea extends from the lower part of the larynx from the sixth cervical vertebra to the fifth thoracic vertebra. Here it divides into the right and left main bronchi. These are subdivided, the right into three divisions, and the left into two divisions going to the lobes of the lungs.

Nerve Supply

The cranial autonomic and the sympathetic nerves supply the trachea and larynx.

Esophagus

Posterior to the trachea and larynx, the esophagus extends from the lower border of the cricoid cartilage to the cardiac orifice of the stomach opposite the eleventh thoracic vertebra. It is about ten inches long and serves as a passageway for food. By a series of peristaltic contractions it passes the food from the pharynx to the stomach.

CHAPTER XX

PRINCIPAL DRUGS USED IN THE TREATMENT OF NOSE AND THROAT DISEASES

These drugs are classified according to their action on the mucous membranes. They are used in various forms, such as sprays, inhalations, gargles and mouth washes, depending on the area to be treated and the nature of the treatment.

1. Stimulants

Use—For mild sore throats or pharyngitis, any of the following sprays may be used in the nose or throat.

Spray 1. Iodi gr. i
Mentholis grs. ii
Eucalyptolis m v

Spray 2. Mentholis grs. v
Eucalyptolis M X
Petrolati Liquidi oz. 1
Iodi gr. i

Spray 3. Camphorae grs. ii
Mentholis grs. v
Iodi gr. i
Petrolati albae ad oz. 1

Use—Particularly good in the treatment of atrophic rhinitis.

2. Protecting

Liquid petrolatum—This is used as a nasal spray to protect and soothe the mucous membrane. It is used freely following irritating and stimulating treatments.

3. Anesthetics

Cocaine, 2-4%, as a nasal spray relieves pain. It also acts as a vaso constrictor. In 5 to 10% solutions cocaine packs are used preparatory to local submucous resections.

Cocaine Poisoning

Cocaine reaction sometimes occurs, as idiosyncracies to the drug are fairly common. Objectively, indications of acute poisoning are pallor, dilated pupils, perspiration, rapid respirations, and pulse. Subjectively, anxiety, apprehension, nausea, vomiting, and possible delirium and coma, if early treatment is not instituted. Indications of reaction should be watched for and the first sign of such reported to the doctor at once.

4. Vaso Constrictors

Drugs which contract the blood vessels are known as vaso constrictors. When applied to the nose they contract the mucous membrane, thereby enlarging the nasal cavities.

a. Ephedrinae Sulph. grs. ix
Aquae Dest. oz. i

This spray is effective in the treatment of sinusitis. It shrinks the membrane and relieves pain.

b. Argyrol 5% sol.
Adrenalin oz. i
Water oz. ss

c. Argyrol 5%
Ephedrinae oz. i
Water oz. ss

Spray c is considered somewhat more effective, although the action is the same as the above combination. Ephedrine, in addition, does not deterioriate as does argyrol.

5. Caustics

Caustics, when applied to the mucous membrane, produce scar tissue. These are used in the treatment of ulcerations, and in checking capillary oozing from malignant growths.

The four commonly used caustics are:

a. Trichlorocetic Acid (Crystals)
b. Chromic Acid 10% solution
c. Chromic Acid and Silver Nitrate Beads
d. Silver Nitrate 5-50%

Preparation of Chromic Acid and Silver Nitrate Beads

Equipment—

Silver nitrate or chromic acid crystals
Wire applicator
Small solution dish
Matches
Alcohol lamp

Procedure—Pour a few crystals of silver nitrate or chromic acid crystals into a porcelain solution dish. Hold the dish over the flame until the crystals are dissolved. Heat the wire applicator until it is red hot, and then dip it slowly into the crystals, and repeat the dipping until a bead of the desired size is formed. Pass it through the flame quickly to smooth off the edges.

Use of the Bead

The area is first cocainized to allay the pain. Rub the bead over the area until the bleeding stops.

6. Inhalations

Inhalations of steam are frequently given in the treatment of inflammation of the larynx and bronchi. Plain steam may be used, or with compound tincture of benzoin. To a quart of boiling water, a dram of tincture of benzoin is added.

Inhalants

a. Ephedrinae grs. iv ss
Mentholis grs. ii
Camphorae grs. ii
Olei Thymi M ii
Petrolati Liquidi oz. i

b. Inhale Epinephrinae oz. iii
Olei Amygdalae Exp. oz. v

These inhalants, mildly irritating, protecting, and constricting, in action may be used over a long period of time without injury to the patient. It is therefore good to use in chronic cases of hypertrophic rhinitis or for post-operative sinus treatment.

7. Gargles

Occasionally in the treatment of acute tonsillitis gargles may be prescribed, although the throat muscles are usually so sore and stiff that gargling becomes very painful and not infrequently impossible. Mild conditions of the tonsils and pharynx, however, may be relieved by a hot gargle.

The commonly used gargles are:

a. Aspirin grs. x dissolved in five ounces of water
b. Sodium salicylate grs. xx in five ounces of water
c. Seiler's solution 1 tablet dissolved in water
d. Dobell's Solution 1 tablet dissolved in water

Any of the above gargles may be used every three or four hours.

8. Mouth Washes

In the treatment of post-operative sinus cases, following nasal operations, plastics, and Vincent's Angina, mouth washes should be given frequently.

a. Liquid Hydrogeni Dioxidi oz. viii. In half strength it is particularly effective in the local treatment of Vincent's Angina.

b. Sodium Perborate oz. ss
Water oz. vi
This also is good for Vincent's Angina.

c. Potassium Chlorate
Dissolve one tablet in ¼ glass of water for stomatitis.

d. Potassium Permanganate 1-5000
This acts as a mild deodorant.

e. Lemon oz. i
Glycerine or albolene oz. i

This is especially good to use following antrum or septum operations. When the mouth is in such bad condition, the albolene or glycerine keeps the membranes moist, the lemon cuts the mucous and leaves a pleasant taste in the mouth.

f. Witch Hazel

Following teeth extraction one half strength witch hazel in hot water makes an excellent mouth wash. It contracts the tissues and checks secretions of the mucous membrane.

9. Miscellaneous

Nasal drops—Used with a medicine dropper.

a. Liq. Neo-silvolis 5% oz. i
5-6 drops adrenalin chloride

Although mildly irritating in its action, neo-silvol nasal drops are frequently prescribed in the treatment of naso-pharyngeal conditions. Use 3-4 drops in each nostril. Follow the drops with an albolene spray. Its bacteriocidal powers are questionable.

b. Argyrol 10%, 3 or 4 drops in each nostril may be given for the same conditions.

CHAPTER XXI

NOSE AND THROAT TREATMENTS

Sprays

Use—Sprays are used in the treatment of rhinitis, particularly the atrophic types, sinus infections, pharyngitis, etc.

Procedure—Spray the nasal cavities three or four times each day with a good atomizer. Incline the head backward during the procedure to allow the solution to run back into the nasopharynx. The Non-spill atomizer may be used, or one which has an adjustable tip for the nose and throat. The DeVilbiss No. 16 has two bottles, one white and the other of colored glass for solutions which should be kept away from the light. Adrenalin solution and Neo-Silvol should be contained in dark glass bottles.

Atomizers with metal tubes which come in contact with the solution inside the bottle should not be used. These are being replaced with tubes of glass or hard rubber which will not corrode from the chemical action of the solution. The Glasseptic Nebulizer manufactured by Parke Davis Company made entirely of glass is a greater improvement. It can hold only a small amount of spray at a time which is advantageous because the solution has to be replenished frequently and therefore does not stand in the atomizer for a long time, becoming unfit to use.

Nasal Drops

Administer nasal drops with a medicine dropper three or four drops in each nostril, (about one half inch of the solution). Place the patient in a dorsal position and hold a cotton pledget under the nose for protection.

Nasal Irrigations

Uses—Nasal Irrigations are used in post-operative sinus cases for cleanliness, in atrophic rhinitis to soften the crusts and to stimulate the growth of epithelium, and for shrinking down nasal mucous membrane in cases of inflammation and congestion.

Equipment—The following equipment is needed:

Irrigating can	Rubber cape
Normal saline 110° F	Rubber sheet
Thermometer	Towel
Irrigation stand	Nasal douche nozzle (glass)
Waste basin	Folded gauze

Procedure—Hang the irrigating can on the stand. Prepare the equipment and the solution and take them to the bedside. Protect the patient with a towel, a rubber cape and a rubber sheet. If the patient is out of bed, arrange the waste basin on a chair or stool in front of him. With the patient in bed place it on the lap.

The position of the patient during the irrigation is important because of the danger of secondary infection of the middle ear and of the sinuses. To prevent this he should bend from the waistline with the head well over the basin for drainage. In irrigating the left nostril, tilt the head slightly towards the right to prevent the solution from getting into the sinuses through the meati. It should be the nurses' responsibility to supervise the patient in maintaining this position during the irrigation. Exhaust the air

from the tube slowly and start the irrigation gently. Instruct the patient to hold the douche nozzle to the nostril as firmly as possible, otherwise the solution will leak out and run down the arms. Regulate the flow by compressing the rubber tubing with the thumb and index finger.

Unless the infection is bilateral, irrigate the unaffected side only to prevent infection from being transmitted from the unclean side to the clean. During the irrigation instruct the patient to breathe through the mouth.

Following the irrigation spray the nose carefully with albolene to relieve any irritation of the nasal membrane. Caution the patient not to blow the nose vigorously following the douche as the solution may be forced into the Eustachian tubes thereby spreading the infection.

After-Care of Equipment

Wash, scour and boil the equipment for ten minutes.

Benzoin Steam Inhalations

Uses—These are used to relieve congestion in cases of membraneous laryngitis, edema of the larynx, or tracheitis.

Inhalations are best given at bed time or in the morning.

Equipment—

Two quart pitcher	Large paper bag
Boiling water	Small blanket
Agate basin	Small rubber sheet

Procedure—Place the pitcher in the paper bag. To a quart of boiling water add one dram of compound tincture of benzoin and mix thoroughly in the pitcher. Roll the mouth of the bag tightly to retain the steam and carry it to the patient in an enamel basin. Instruct the patient to hold the face over the mouth of the bag to prevent the escape of steam. A small blanket or heavy towel thrown over the head will assist in this process.

For continuous inhalation a regular steam inhaler with a long pipe may be used to the best advantage in a croup tent, (outside) with the pipe extending through an opening in the blanket. This allows the steam to escape within. This is a particularly effective method in the treatment of bronchial conditions in children. Care must be exercised that the stove is placed securely and away from the bedclothing to prevent fire.

After-Care of Equipment

Wash, scour, and boil for ten minutes. Dry carefully and replace. Benzoin leaves a dark brown sediment on the inside of the pitcher; scour it with benzine or bon ami to remove the deposit.

Hot Compresses

Use—Hot compresses are used locally in the treatment of furunculosis of external nose.

Equipment—

One solution bowl
Paper bag for waste
Sterile gauze squares 2x2
Vaseline
Witch hazel, boric acid 1-50, or saline
Two forceps or hemostats

Procedure—Pour boiling water into the basin and add the antiseptic solution. Fold the compresses and place them in the basin. Place the patient in a dorsal position. Protect the skin by a layer of ointment. The pledgets are wrung out as tightly as possible before application by the use of the forceps or the hemostats. Compresses should be applied for about eight minutes or as ordered.

Cold Compresses

Use—These are used in the local treatment of epistaxis and erysipelas of the nose, following post-operative septum

after packs have been removed to relieve congestion. Iced witch hazel compresses are also refreshing when applied to the forehead during ether recovery of tonsillectomy cases. One dram of aromatic spirits of ammonia poured over the ice has the same reviving action.

Equipment—

Enamel basin
Folded towel in basin
Block of ice (or cracked ice)
Paper bag for waste
Gauze squares 2 x 2
Vaseline
Boric, saline, witch hazel, or saturated solution of Epsom Salts, 2 ounces each

Procedure—Arrange the compresses on the ice and pour two or three ounces of the solution ordered into the container. Ring out the compresses as dry as possible before application. Protect the skin from frostbite with vaseline. Iced compresses should not be continued for longer than ten minutes at a time.

THROAT TREATMENTS

Painting the Throat

Purpose—Painting of the throat is done for acute and chronic pharyngitis and tonsillitis.

Equipment—The following equipment is needed:

Long swabs or wire applicators
Tongue depressor
Waste basin
Drugs
Argyrol 10 to 25%
Silver nitrate 5%
Methelyne blue
Iodine) 1
Glycerine) 8
Neo-Silvol 10-24%

Procedure—Painting the throat must not be done by nurses unless ordered by the doctor. A long applicator is dipped into the solution. Depress the anterior portion of the tongue and gently pass the swab two or three times over one side of the tonsillar ring. This may cause the patient to choke, particularly those with sensitive throats, therefore allow a few minutes to elapse before attempting to treat the other side.

Throat Irrigations

Uses—These are used in acute tonsillitis and pharyngitis or in case of acute inflammation wherein the patient is unable to gargle. As a rule throat irrigations are easier to take than gargles and as a larger quantity of solution is used, the effect of the heat is more lasting.

Equipment—

Irrigating can	Small solution bowl
Normal saline 110° F.	Squares gauze
Thermometer	Rubber sheet
Irrigating stand	Rubber cape
Waste basin	Towel

Rubber irrigating tip

Other solutions used for throat irrigation are glucose 5% (especially good in scarlet fever), soda bicarbonate 1 dram to the pint, and potassium permanganate 1-5000.

Procedure—Hang the irrigating can on the stand. Apply rubber cape and towel and place the waste basin on a chair in front of the patient. Instruct him to bend from the waistline as far over the basin as possible with the head slightly projected forward. Exhaust the air from the tube and hand the tip to the patient who inserts it into the mouth until the stream strikes the pharynx. Instruct him to move it from side to side over the inflamed area.

If the treatment proves tedious to the patient, discontinue the irrigation temporarily and allow a change of position for a few moments.

After-Care of Equipment

Wash, scour, and boil for ten minutes with the tubing disconnected from the can and the clamp released. Dry and replace in a large basin with other necessary equipment ready for the next irrigation. If possible have a separate can for nose, for throat and for ear irrigations. Label with "N", "T", and "E" respectively.

Gargles

Uses—Gargles may be used effectively following tonsillectomy (this is not approved of generally), and in the treatment of acute tonsillitis. It is not always an easy or a comfortable procedure for the patient.

Procedure—Prepare the gargle with a solution 128° or 130° F. or as hot as the patient can stand it. Instruct him to hold the solution as far back in the throat as possible. Repeat the gargle every three or four hours until relief is obtained.

Emergency Equipment

A tray containing the following supplies should be kept in a convenient place in the ward to use in emergencies—hemorrhages—post-operative tonsil, septum, antrum, and ear cases.

This equipment should be inspected frequently by the head nurse, and be kept complete and in perfect order.

Emergency Tray

3 hemostats (Kelly)
1 needle holder

1 tongue depressor (metal)
1 metal mouth gag
1 nasal speculum
1 forceps (plain)
1 bayonet forcep
1 probe
1 Hurd pillar retractor
1 sponge holder
2 tenacula
1 curette
1 scissors
Half curved tonsil needles No. 24 and No. 14
5 catheters No. 10-14-18-20-26
2 jars sterile sponges
1 jar post nasal plugs
1 jar Mosher strips
1 jar vaseline gauze
1 jar stuffed finger cots
1 pkg. sterile towels
1 jar sterile cotton
2 bottles adrenalin 1-1000
Glyceride tannin
1 bottle tannic acid powder
1 bottle alum
1 roll adhesive
2 throat sticks
2 catgut sutures (1 plain 1,) (1-00)
1 bottle silver nitrate 2%
Chromic acid 85%

The following equipment is kept in the refrigerator:

1 enamel oblong tray containing:
2 bottles thromboplastin subcutaneous
1 bottle hemostatic serum
1 bottle suprarenin 1-1000
3 ampules bacterial vaccine
2 ampules emetine hydrochloride
6 peptonizing tubes
5% glucose in distilled water
10% glucose in distilled water
Extract of coffee

Appliances

Ice Collars

Use—These are used as a means of applying cold to the neck and throat. Routinely they are prescribed for post-operative tonsillectomy cases. Ice has a soothing effect and may lessen the danger of hemorrhage.

Procedure—Ice collars should fit the neck closely if they are to do the most good, and they should therefore not be filled more than two-thirds full. Crack the ice into fairly small pieces and allow the air to escape from the collar before filling it. The washer should be in good condition to prevent leakage.

Cover the collar with gauze or a thin towel and carry it to the patient.

A folded towel tucked under the collar in front will prevent it from sagging. An ice collar which hangs loosely about the neck, resting on the chest for the most part, is absolutely of no value to the throat.

Ice Bags

Use—Ice bags are used to apply cold to the head, neck, or face. Ice to the face and head is very comforting following operations on the antra, the nose or the frontal sinuses.

Procedure—Crack the ice into small pieces and fill the bag. It should not be too full, as the weight of the bag may be uncomfortable. Fill it about two-thirds full and exhaust the air from the bag before putting on the cover. Cover with gauze or a towel before carrying the bag to the patient.

Plaster Casts of the Face

As a legal record, plaster casts of the face are made before and after operation.

Equipment—The following equipment is needed:

Salt
Vaseline
Plaster of Paris
Basin
Large tablespoon
Cotton
Throat sticks
Ether cardboard
Aluminum frame for face
Tepid water
Newspapers

Procedure—Place the patient on a table or bed as comfortably as possible in the dorsal position, chin up, arms raised, with the hands under the head.

Protect the bed with several thicknesses of newspapers. Rubber sheeting or newspapers should protect the patient's chest and shoulders.

The aluminum frame is adjusted, and is placed on the face (cardboard may be used). A second person is necessary to hold the frame in place during the procedure.

Protect the skin with a layer of ointment (boric acid or plain vaseline), including the forehead, as far back as the ears. The plaster, as it dries and hardens, generates heat to the extent of burning if it is not watched carefully. The patient is instructed to breathe through the mouth and to tell the doctor as soon as the plaster begins to get hot.

Bits of cotton are placed gently inside the nose (avoid packing) to prevent the plaster from entering it.

The plaster is mixed with tepid water, to the desired consistency, then poured over the patient's face. It is allowed to set and is then removed by the doctor.

The few remaining bits of plaster on the face are removed easily with soap and water.

CHAPTER XXII

THE NURSING CARE IN DISEASES OF THE NOSE, THROAT AND SINUSES

Diseases of the Nose

Acute Rhinitis

Acute rhinitis or "head cold" is merely an acute inflammation of the nasal mucous membrane.

Etiology—A lowered resistance with invasion of microorganisms is a common cause.

Symptoms—A profuse watery discharge, a sense of dryness in the nose, headaches, sneezing and lacrimation characterize the disease.

Treatment—Systemic—The treatment consists of rest in bed, a hot bath, forced fluids, catharsis, aspirin or empirin compound grs. 10 every four hours, and rhinitis tablets to dry up the secretions. Vaccines are used extensively but not always with great success.

Local—A nasal spray of adrenalin or ephedrine inhalant can be given to shrink the membrane thereby promoting better drainage. Follow this with an oil solution such as albolene to protect the membrane. Apply an ice bag to the head for severe headache.

Complications—Common complications of acute rhinitis are sinusitis, acute otitis media and pneumonia. Although a "cold" is largely self-limiting, the treatment outlined may assist in retarding the development to a certain extent and in preventing complications.

Epistaxis (nose bleed)

Etiology—This condition is seen most commonly in children following trauma. Idiopathic origin, hypertension, and hemophilia are other causes. Epistaxis usually occurs in the lower anterior third of the septum in Kisselbach's area.

Treatment—Have the patient in an upright position either in bed or on a chair. Have plenty of gauze or compress to hold to the nose. Dip small cotton pledgets into adrenalin chloride, 1-1000, if available. Place these inside the nares over the bleeding point and press from without for about five minutes, or until the bleeding is controlled. If adrenalin is not obtainable, any household styptic may be used such as hydrogen peroxide, lemon juice or vinegar.

An ice bag to the head and ice compresses to the nose will help in controlling the hemorrhage.

Nasal Foreign Bodies

In childhood foreign bodies in the nose are seen commonly, especially in children of the creeping age. Articles such as buttons, beads, small pieces of coal, and various other small objects are often inserted into the nares. These of course produce irritation and necrosis of the mucous membrane with a foul discharge. In very young children, nasal foreign bodies may be detected by nasal obstruction and a watery discharge, unilateral (later becoming purulent). Older children will complain to the parents of pain or discomfort.

Treatment—Foreign bodies should be removed only by specialists, therefore no attempt should be made by the nurse to remove them. Usually primary ether is necessary.

Adenoids

Children with hypertrophied adenoids present a classical picture which is easily recognized. A dull expressionless face, mouth breathing, mental deficiency, thick lips, impaired hearing, night terrors, lack of resonance in the speech, etc., are characteristic signs. They are also subject to recurrent attacks of colds and otitis media.

Treatment—The only treatment is of course the removal of the adenoids. Children in school are frequently seen with adenoid symptoms and school nurses should be able to recognize these signs. Through the school nurse they are brought into the clinic for examination and operation. Early treatment is imperative, as diseased adenoids are known to be the cause of chorea, mastoiditis and digestive disorders.

Nasal Discharge

Types and significance—Nasal discharge of various types in adults or in children may be characteristic of certain conditions. Particularly in children, it is significant and is often a sign of certain infectious diseases, as diphtheria, for example. The condition can be classified into two general types.

1. The first type is characterized by an acute inflammation of the nose and sinuses accompanied by a thin watery or mucoid discharge. Under this group is classified acute rhinitis, vasomotor rhinitis and acute draining sinuses.

2. The second type includes the chronic and purulent cases. Chronic inflammatory conditions are accompanied by muco purulent foul discharges and crust formation. This group is by far the most common and most serious.

Under this is classified atrophic rhinitis characterized by

crust formation in the nasal cavity. Luetic and diphtheritic nasal conditions are also classified under group two.

In childhood a persistent nasal discharge which is thick and foul coming from one side of the nose is strongly suspicious of diphtheria. The discharge is usually tinged with blood.

Tubercular, diphtheritic and luetic conditions of the nose should be treated with precaution. Waste cotton and gauze used about the nose should be burned. Caution the patient to avoid kissing people as the discharge is infectious and in this way the infection is transmitted.

Unilateral discharges of a short duration in young children are suspicious of foreign bodies.

Patients complaining of constant postnasal "dropping" should consult the doctor for diagnosis. A draining sinus is very often the cause for this symptom.

DISEASES OF THE THROAT

Tonsillitis

This is an inflammation of the faucial tonsils, acute or chronic in form.

Etiology—The predisposing causes are exposure to cold and wet, lowered resistance, unhygienic living conditions and certain bacteria, most frequently streptococcus.

Symptoms—Tonsillitis is most often ushered in with chills, fever, sore throat, pain upon swallowing and general malaise. The temperature may rise to 103° or 104°. The local examination reveals an edematous orthopharynx. Sometimes pus is seen exuding from the tonsils or patches of exudate yellowish-white in color over the tonsils and surrounding area.

Treatment—The local treatment consists of hot irrigations of alkaline solution, saline or glucose 5%. Apply an ice collar.

The general care is also important—rest in bed, force fluids, catharsis, aspirin or empirin grs. 10 every two or three hours. Watch for salicylate poisoning especially tinnitis. Apply an ice cap to the head for headache. Sometimes iced compresses with a dram of aromatic spirits of ammonia poured over the ice is effective in relieving the headache.

Indications for tonsillectomy depend entirely upon the belief of the doctor. Usually, however, after repeated attacks tonsillectomy is indicated.

Complications—The common complications of diseased tonsils are heart and kidney conditions, arthritis and chorea (in children).

Vincent's Angina

This is an ulcerative condition of the mucous membrane commonly seen in the mouth and around the gums. It is sometimes known as Trench Mouth.

Etiology—The direct cause is unknown, but it is associated with a fusiform bacillus and a spirillum differing but slightly from the treponema pallidum of syphillis.

Symptoms—Ulcerating sloughing masses with deep excavations dirty gray in color characterize the disease. It is accompanied by a foul odor. There is usually some pain and at times a slight elevation in temperature.

Treatment—The organism, an anaërobe (requiring no oxygen or light for its growth) is found under the margins of the ulcers. For this reason oxidizing drugs are used beneficially in the treatment. Sometimes hydrogen peroxide

half strength and potassium perborate mouth washes are prescribed. The slough is then removed with swabs of peroxide and the lesions painted with chromic or trichlorocetic acid or methylene blue. The disease is very often unresponsive to treatment and the course is usually of long duration. Build up the resistance with cod liver oil, etc. Vincent's Angina is contagious and individual precautions should be observed.

Diphtheria

An acute contagious disease of the mucous membrane of the nose or throat.

Etiology—The Klebs-Löeffler Bacillus. A large percentage of these cases occur in childhood under ten years of age.

Symptoms—The usual symptoms are: Chills, moderate temperature, sore throat and malaise. Often a child will merely complain of malaise in the early stages; later when the absorption of toxins is greater, the prostration may be severe.

Diagnosis is made by positive culture and the presence of a membrane, dull gray in color and closely adherent in the throat. It usually involves one or both tonsils and the uvula, but may extend to the larynx in severe cases.

Treatment—The main factor in the treatment is antitoxin which to be of value should be given as early in the disease as possible. Except from the standpoint of differential diagnosis the nursing care of diphtheria will not be discussed at length, as these cases are always sent to a contagious hospital for special care.

It is of great importance, however, that nurses should know the main points of differentiation between membranes of diphtheria, acute tonsillitis and Vincent's Angina. All

suspicious looking throats should be treated with precaution pending diagnosis.

The following table gives a comparison of the characteristic points of differentiation for tonsillitis, diphtheria, and Vincent's Angina.

	Acute Tonsillitis	*Diphtheria*	*Vincent's Angina*
Onset	Sudden	Insidious	Same as tonsillitis
Etiology	Bacteria — Exposure to cold and wet	Klebs-Löeffler Bacillus	Fusiform-Bacillus and spirochete Refringens
Temperature	High 102°-103°-104°	Low at onset followed by rise	Slight elevation
Membrane	Patches yellow-white exudate over tonsil and surrounding area.	Dirty gray patches with raised edges, bordered with purple congestion. Covers tonsil, soft palate and post-pharyngeal wall. Removes with difficulty leaving raw bleeding surface. Reforms quickly.	Grayish-green ulcerated masses — irregular, having deep excavated appearance.
Diagnosis	Symptoms — Appearance of membrane. Smear and culture in severe cases.	Smear and culture to isolate organism.	Smear and culture —Wasserman.

DISEASES OF THE SINUSES

Sinusitis

Sinusitis is an inflammation of the lining membrane of a sinus. The condition can be acute or chronic. Sinusitis may follow pneumonia, influenza, abscessed teeth, rhinitis and measles.

Symptoms—The characteristic symptoms are pain and severe headache (worse in the morning, clearing up in the late afternoon). In maxillary sinusitis the teeth feel elongated.

Aids in Diagnosing

1. Local examination.

Look for pus in the middle meatus or in the nasopharynx. If the sinus is draining, secretion will be seen.

2. Transillumination.

In conjunction with the local examination, transillumination reveals thickened membranes and other infections of the sinuses. It also indicates the necessity of further examination by X-Ray. The sinuses in various individuals vary so greatly that transillumination can not be relied upon to any great extent.

Procedure—Take the patient into the transillumination room. Female patients should be chaperoned. To illuminate the frontal sinuses a strong light is held under the superior margin of the orbit just under the brow.

The maxillary sinuses are illuminated by placing the light in the patient's mouth, closing the lips tightly. The light is held in a protector, a glass tube about one and one-half inches long. Following the transillumination, wash and boil the protector and place it in alcohol.

3. X-Ray.

To make a positive diagnosis follow the transillumination with an X-Ray of the sinuses under suspicion.

CHAPTER XXIII

PREPARATION AND POST-OPERATIVE CARE—NOSE, THROAT AND SINUS DISEASES

1. Nasal Operations, including septa, intranasal and radical antra, etc.

Local Anesthesia

When the operation is to be done under a local anesthetic (adults), the patient may have a light breakfast consisting of toast and coffee—orange juice and toast with butter if a child.

Ether Preparation

For adults the ether breakfast should consist of black coffee with sugar and no cream—for children, one-half glass of orange juice with a teaspoon of sugar.

A suds enema is given and a specimen of urine is sent to the laboratory. A hypodermic of morphine and atropin may be ordered.

2. Sinus Operation—Frontals, antra, ethmoids and sphenoids

Local anesthesia—The patient is allowed a light breakfast of toast and coffee. A hypodermic of morphine and atropin may be ordered.

Ether anesthesia—This is the same as for the ether preparation for a nasal operation.

3. Throat Operation

Local—The same as that outlined above.

Ether—The same as for sinus and nose operations.

In preparation of male patients for surgical tracheotomy, a local shave may be necessary.

Post-Operative Nursing Care

Septum—The post-operative care of septum cases under local or ether anesthesia is practically the same except that a medium high backrest is given to local cases as soon as they return from the operating room, otherwise this is done only after the ether recovery is complete.

On the day after operation use a nasal spray every hour or two (Spray 2a, Chapter XX). Swab the mouth frequently with albolene. To make this more palatable add a few drops of lemon juice. Wash off the blood stains about the nose and face with peroxide 5%. This should be done carefully so as not to loosen the packs or injure the nose. An ice bag to the nose will give comfort and aid in relieving the congestion.

The diet consists of liquid the first night followed by soft solids the next day.

The second day following operation give a cathartic, castor oil or magnesium sulphate.

Watch for bleeding. Blood serum usually oozes from the nose for two or three hours after the operation. This should be watched closely of course, and reported to the doctor if it becomes profuse. The nose may or may not be packed.

An order for morphine may be given the night of operation. Keep plenty of folded gauze or cellucotton on the table, as the nose drips constantly at first. A paper bag pinned to the bed or fastened to the table with adhesive is useful for soiled gauze. If the atomizer is kept on the bed-

side table, cover the nasal tip with gauze fastening it with a rubber band to protect it from dust.

Removing Nasal Packs

For removing nasal packs, the following equipment is needed:

Equipment—

Rubber sheet
Towel for neck
Tray containing:
Sterile gauze and cotton
Nasal speculum
Bayonet and straight forcep
Pus basin
Peroxide half strength in solution dish
Drop light

Prepare the patient. He should be propped up in bed with a rubber sheet in the lap and a towel about the neck. Arrange the drop light conveniently. Hold the pus basin under the chin.

Killian Operation—(Frontal sinus)

The general nursing care is very important. Make the patient as comfortable as possible with medium high back rest to promote drainage, soften the crusts and clots in the nose with albolene drops. Give a saline cathartic the following morning and force fluids. A mouth wash is given whenever desirable.

Dressing

Equipment—The dressing for this operation requires the following equipment:

Sterile gloves, gauze, and eyepads
Sterile nasal speculum, bayonet forcep, scissors (straight)
Forcep, medicine dropper, boric ointment
Pressure bandage
Adhesive

Waste basin
Boric solution
Sterile cotton, Mosher strips, and iodoform gauze
Atropin 1%

Antrum, Ethmoid and Sphenoid Operations

Give the patient a medium high back rest for comfort as soon as he returns from the operating room and is out of ether. Apply an ice cap to the face and to the head for headache. A menthol spray to the nose every two or three hours, and a cleansing mouth wash, may be used as needed. Swab the lips with albolene and wash off the blood stains about the face with peroxide half strength. Force fluids as much as possible.

Liquids without milk may be given for the first twelve hours followed by soft solid diet the second day. Catharsis, either castor oil or magnesium sulphate, is given on the second day.

Watch for hemorrhage. Morphine is usually prescribed the night of the operation.

Tonsillectomy

Tonsillectomies are done under local or general anesthesia.

At the bedside have the following equipment:

Mouth gag, metal or wooden
Boric acid ointment
Adhesive plaster
Tongue clamp
Throat sticks
Pus basin
Large basin
Cellucotton or gauze
Paper bag

Local anesthesia—Give the patient a back rest immediately after the operation. Apply an ice collar to the neck and

to the head if desired. Cold liquids may be given freely, especially iced milk.

Locally for the throat Orthoform tablets or aspirin grs. 10, powdered, held on the back of the tongue will coat over the throat and have a soothing effect. Repeat every two or three hours. Occasionally warm gargles are ordered, but this is not ordinarily advised. Caution patients not to cough or to clear the throat unless it is absolutely necessary, for in that way hemorrhage is frequently started. If the patient complains of dropping in back of the throat or raises an amount of bright red blood, report it at once to the doctor.

Ether—Watch for hemorrhage during the ether recovery. Continuous swallowing in the unconscious stage is indicative of this and should be reported to the doctor at once. The pulse is not altogether dependable, as considerable blood can be swallowed before the quality or rate of the tonsil pulse changes.

Hemorrhage occurs most commonly the first few hours after operation; therefore, a close watch should be kept until the patient has fully regained consciousness.

A back rest is to be given as soon as the patient is out of ether. An ice collar will be soothing to the throat. Until the nausea subsides give nothing but cracked ice by mouth. Soft diet, such as soft milk toast, dropped eggs, mashed potatoes, fine cereals, coffee, tea, etc., may be started the following day. Liquids are taken more easily through a drinking tube. Restrict the diet to soft foods for about five or six days. As the throat heals, other foods may be added. Not until after the eighth day of operation is the patient out of danger of hemorrhage.

Hypodermics of morphine may be necessary the night of the operation to insure the patient of a good night's rest.

Adenoidectomy

These patients, usually children, are given the usual ether preparation.

Following the operation they are placed in bed, with a pillow under the abdomen and the head lower than the shoulders, to promote better drainage from the nose and mouth. A slight oozing from the nose continues for several hours after operation.

Allow the patient to rest quietly as much as possible. No change in the diet is necessary. Force fluids.

Tracheotomy

Tracheotomies may be done as a surgical procedure or as an emergency.

Purpose—In any case the purpose of a tracheotomy is to establish a direct communication between the lungs and the external air. In any disease wherein the lumen of the larynx is narrowed, a tracheotomy may be necessary. Malignancy of the larynx, laryngeal diphtheria, laryngeal foreign bodies, scar tissue (as a result of tuberculosis or Lues of the larynx) and oedema or inflammation, resulting from acid or alkali burns, may require the operation.

Preparation

Prepare the area from the tip of the chin to the sternum, around the neck to the lobes of the ears, down to the shoulders, using green soap, sterile water, and alcohol, and cover with a sterile towel fastened in place by bandage. Occasionally on male patients the area must be shaved.

A local injection of novocaine one-half of one percent, with a few drops of adrenalin is usually given. Ether, in

most cases is contraindicated because of its irritating effect on the mucous membrane.

The equipment necessary for the operation will be discussed in Chapter XXIV.

Post-Operative Care

The following equipment should be arranged at the bedside upon the arrival of the patient from the operating room.

Feathers, pipe cleaners or narrow strips of gauze (with edges turned in) to clean the tube.

Tooth pick swabs
Sterile tracheotomy tube (extra)
Tracheotomy dressings
Boric acid ointment
1 roll ½ inch linen tape
Forceps in alcohol
Boric solution 1-50
Dilator
Paper bag for waste
Tracheotomy set
Suction machine if available, although in the homes this is not practical.

Silver tracheotomy tubes are used most frequently although those made of gold, platinum, aluminum, or any metal which does not corrode may be substituted. The size ranging from No. 1 to No. 6 depends upon the patient.

Special nurses night and day for the first twenty-four hours are advised.

Procedure—Place the patient on the abdomen, over a stiff pillow, with the head turned to one side. The tube or opening of course must be entirely unobstructed at all times for drainage. Occasionally a tube is not inserted, in which case the wound is held open with skin clips. For the first few hours after operation, a frothy bloody discharge drains out of the opening. Keep the patient on the abdomen until

the drainage is complete; then put him on a low back rest to facilitate breathing. Keep a tank of oxygen near the bedside for emergency. If oxygen is necessary, it may be given by the nurse, by passing a catheter through the tube into the trachea. Regulate the force of the gas by the water bottle attachment on the tank. Watch the patient's color, pulse and respiration. The slightest amount of blocking in the tube causes the patient to become cyanotic, and a violent seizure of coughing follows. In this case the mucous plug must be removed either by removing and cleansing the inner tube or by the use of the suction apparatus and a catheter, the end of which is held to the opening of the tube to draw out the mucous. Unless permission is granted by the doctor, only the inner tube may be changed and cleaned by the nurse. This may be done as often as is necessary. The outer tube is changed by the doctor usually once daily.

If the tube should be coughed out, as it sometimes is and the patient is unable to breathe, the nurse should attempt to replace it with the extra sterile tube which should be on the table kept for such emergencies. If the tube is unavailable, hold the edges of the wound apart with a dilator. If the air passage is free from mucus this will allow the patient sufficient air to keep him alive until the doctor arrives.

Cleaning the Tube

Carefully remove the inner tube, dip it in boric solution and pass narrow strips of gauze through it to remove all mucus. All raw edges of the gauze should be turned in to avoid particles of lint and thread from being inhaled into the lungs.

The tube is then replaced. The outer tube is held in place by linen tape passed through the loops on each side of the tube and around the neck, tying it on the side. When changing the tape, instruct the patient to support the tube with the finger to prevent its falling out during the process.

Dressing

The area around the wound is protected from irritation from the tube or from secretions by the application of a Mosher dressing. This fits closely around the edges of the wound, the flaps of which are passed up over the tapes and are held in place by small safety pins (Tracheotomy dressing Chapter XXIV). These may be changed as often as necessary.

A single layer of moistened gauze, laid over the opening of the tube moistens the air as it enters and acts as a protection against dust.

The Incision

This must be kept absolutely free from irritation. Wash around the edges with warm boric solution and keep it well lubricated with plenty of boric ointment. The condition of the wound depends entirely on the nursing care.

Diet

Liquids are allowed the first day and soft solid diet as desired the second day. This depends largely on the reasons for the tracheotomy. Usually children are kept on liquids a day or so longer.

Room Temperature

This is important as tracheotomy patients breathe more easily in a somewhat moist atmosphere of about 80° F. Protect the patient from draughts as they are prone to pneumonia and other respiratory infections. Children are

best cared for in a croup tent with continuous benzoin inhalations.

Removal of the Tube

The length of time a tracheotomy tube must be worn depends entirely upon the individual case. The tube is removed in such cases as laryngeal oedema as soon as the oedema subsides. A few days are necessary following the removal of a foreign body. Some cases such as Lues of the larynx or malignancy may have to wear the tube for life.

Tracheotomy tubes cannot be removed at once, but gradually. Until the patient accustoms himself to breathing normally through the nose again, the tube should not be removed permanently.

A small cork (sterile) covered with a thin layer of sterile gauze may be inserted into the opening of the tube for a few moments at first. Increase the time gradually during the day, depending upon the reaction of the patient. The tube is then removed to allow the incision to heal. Until the wound is ready to heal, it is best to replace the tube at night as breathing is more difficult when the patient lies down. Sometimes narrow bands of adhesive are strapped over the wound to hasten granulation.

If the tube must be worn for life, teach the patient the proper care of the wound and the procedure of removing and replacing the tube. A large silk handkerchief folded diagonally, fastened around the neck makes a neat covering for the tube.

The mental attitude of tracheotomies with malignancy must be observed carefully as occasionally suicidal tendencies are shown. This of course applies for the most part to

patients who have been told of their condition and who realize that recovery is impossible. Any of these signs should be reported to the doctor.

Esophagoscopy

First Twenty-Four Hours After Operation.—Allow the patient to rest as much as possible. At eight o'clock, the day of the operation, give bismuth subnitrate grs. xv and repeat at eight the next morning and at twelve noon.

Give nothing by mouth but cracked ice for the first twenty-four hours. Moisten the lips with damp gauze and albolene. Administer by rectum vi oz. 5% glucose solution every four hours.

Diet—At twelve noon the second day, soft solids are allowed. The following day continue soft solids and on the third day resume the regular house diet.

Bronchoscopy

Bronchoscopies are usually done under local anesthesia. Three hypodermics of morphine sulphate grains 1/6 are given to adults every half hour. Morphine poisoning must be watched for and any indications reported to the doctor. The dose for children is usually morphine sulphate grains 1/12, one-half hour before operation.

Fluids may be given freely for the first twenty-four hours and regular diet the next day.

Laryngectomy

Fundamentally the nursing care of laryngectomies and tracheotomies is the same. The bedside equipment is the same and the patient should be specialed. The anesthetic is usually ether, therefore the routine ether preparation.

Hare Lip

Adults—Keep nostrils clean and free from clots and crusts with albolene applications. This tends to keep the sutures within the nose clean and prevents infection.

A soft bland diet of milk, eggs, soft toast, etc., should be given—only foods which do not require any chewing as that causes the lips to move and may interfere with healing processes.

The sutures are swabbed with compound tincture benzoin over which is placed a small dressing. Fasten this with a band of adhesive, one on each side, starting from the back of the neck. The hair in that region should be protected by gauze. Carry the adhesive forward under the lobe of the ear and across the cheek to the dressing, pulling each strip tightly. This supports the incision and holds it together securely.

Nurses should attend to the strapping and dressing, keeping it in place and changing it if it becomes soiled.

Infants

Keep the patient from crying as much as possible even to the extent of holding it a good deal.

Keep the incision covered with benzoin and a dry dressing, the adhesive of which is fastened in the same manner as outlined for adults. Change the dressing frequently. Breast milk should be obtained for small babies if possible, otherwise a formula. Hold the child and feed it with a medicine dropper. After the fourth or fifth day after operation, the child is usually put to breast or is given the bottle if ordered by the doctor.

CHAPTER XXIV

NOSE AND THROAT OPERATING ROOM DUTIES—SURGICAL EQUIPMENT

Nurses' Duties

The head nurse instructs the students in the surgical scrub, in the setting up of sterile tables, and if they scrub to assist at the operation, she is expected to coach and supervise. The head nurse also assists in adjusting the patient and the patient's clothes on the operating table, or in adjusting the table. She also keeps the sterile table supplied with the necessary equipment.

After the operation she is expected to assist the etherizer in applying the bandage. Wards should be called for cases ten minutes before the time scheduled for operation.

Student nurses should set up sterile tables, assist at operations, hold heads of patients during operation, clean instruments, keep the operating room picked up and chaperone patients to and from the wards. Students also make supplies in their spare time.

Surgical Scrub

Scrub the arms under running water, from the elbows to the wrists, allowing one minute for each arm. Hands require one minute; push back the cuticle, clean the nails, and scrub the hands two minutes each with special attention to the sides of the fingers. Rinse the hands and arms one min-

ute with the hands held downward. Soak the hands in alcohol, 50%, for two minutes.

Close the hands as the sterile gown is pulled on. Dry the hands on the gown above the waistline, powder (sterile powder) and draw on sterile gloves.

The cap, covering all hair and the face mask should be applied before the scrub.

Sterilization of Instruments

The procedure for sterilizing nose and throat instruments is the same as that followed for sterilizing ear instruments with the exception that bronchoscopes, laryngoscopes, and esophagoscopes are soaked in alcohol 50% for ten or fifteen minutes. Following the use of instruments in lung abscess cases, they should be soaked in alcohol for two hours before putting them away.

Surgical Equipment

Nasal Plastic, Deformities and Fractures

Dissecting set with rasps, saws and elevators are required, and bone and skin graft instruments if necessary. Plenty of suture material is usually needed such as catgut, silk worm gut, horse hair, and silk. Dental modelling compound should also be included. This is used as a dressing to hold the tissues in place.

Preparation of the Modelling Compound

Soak the compound in bichloride 1-1000 for one hour before operation. Place it in hot water for one minute to soften before use.

Fractured Nose

Nasal speculum, pair of forceps, and elevator are necessary. The patient is given a little gas before the fracture is reduced.

Septum Resection

For a Septum Resection the following instruments are needed:

1 septum knife
1 nasal speculum
1 medium Killian
1 long Killian
6 blunt dissectors, different kinds
1 double-ended elevator
1 Ballenger swivel knife
1 biting Jansen
1 slim Jansen
1 biting through Jansen
1 Luc forcep
1 scissors
1 turbinate scissors
1 turbinate snare
1 conchotome
1 mouth gag
1 tongue depressor
1 uvula retractor
1 Hooper forcep
Post nasal pack
Small cotton balls
Mosher strips
Sterile vaseline
Anterior nasal packs (finger cot with gauze packing)
1 needle threaded with silk

Tonsillectomy

A tonsillectomy requires the following set-up:

3 Fowler snares
2 tenacula
2 sponge carriers
Mouth gag
Tonsil sponges
Suture material
Needle holder
2 needles, half circle (non-cutting edge)
Adenotome
2 tonsil hemostats
Lothrop tonsil knife

Pillar retractor
Ring punch
Waste basin
No. 0 catgut

Arrange the equipment on one end of a sterile table; on the other end is arranged a duplicate set. With one set in use, boil the other, to be ready for use as soon as the operation is over. Between cases change the sterile towel on which the instruments are placed.

Retropharyngeal Abscess

The following instruments are needed for retropharyngeal abscess cases:

Mouth gag
Tongue depressor
Sponge forceps
Long knife
Tongue forceps

The patient, if a child, may be held in the lap of the nurse facing the doctor. The right hand of the nurse is held on the forehead of the patient, while the left arm is passed around the waist. The Rose position may be preferred. In this the patient is flat on the back with the head lower than the shoulders.

Immediately after the incision is made, the patient is turned upside down and held by the heels for a few seconds, to allow pus to drain out of the mouth. Complete instructions, therefore, should be given to the nurse before the operation. An emergency tracheotomy set should be in readiness.

Peritonsillar Abscess

These require the following:

Knife
Tongue depressor
Sponge holder
Mouth gag

Tracheotomy

The instruments and supplies required for a tracheotomy are the following:

1 knife
2 scissors
2 toothed forceps
2 dressing forceps
2 forked retractors
1 trachea hook
1 trachea dilator
4 hemostats
1 Ring punch
1 needle holder
2 Mosher breathing tubes
Tubes Nos. 1, 2, 3, 4, 5, 6, 7
2 cutting edge needles
3 strands silk worm gut
1 tube plain catgut
2 towels
2 sheets
6 sponges
2 rolls linen tape

This is an emergency set which is done up in two sterile sheets, tied with bandage and sealed with wax. On the outside of the bundle is a list of the equipment contained within. Mosher breathing tubes are placed on the outside of the first sterile sheet.

The dry goods are autoclaved for forty-five minutes under fifteen pounds of pressure. The instruments and suture material are boiled for ten minutes.

A sterile table is set up and a nurse scrubs before doing up the sterile bundle.

An emergency tracheotomy set is kept on each ward. By keeping the equipment done up in the sterile bundle sealed with wax, the set is always complete and ready for use in emergencies.

For surgical tracheotomies a duplicate set is used with additional instruments as desired by the surgeon.

If local anesthesia is used add sterile novocaine 1% and adrenalin chloride 1-1000, with a Record syringe, two needles (long and short) and a small solution dish. Just before the incision is made in the trachea, an injection of cocaine, usually 10%, is made directly into the trachea tissues. The cocaine however, should never be placed on the table with the novocaine.

Preparation of Patient

Scrub the area (from the tip of the chin to the sternum) with green soap and water followed by iodine. Place the patient on a table in a dorsal position, with a sand bag or a folded blanket under the shoulders to flex the neck. All clothing should be stripped from the neck and shoulders.

Antrum Wash

Antrum irrigation requires the following instruments:

Nasal speculum
Metal syringe
Trochar with rubber tubing
Rubber sheet
Sterile sheet
Waste basin
Normal saline (warm)
Cocaine 4%
Sterile cotton
Bayonet forcep

Fasten a sterile sheet around the patient's neck covering the lap. Hold the head if necessary during the puncture.

Intranasal Antrum

For this procedure the following instruments are needed:

Intranasal set, nasal speculum
Bayonet forcep
Antrum rasps
Metal syringe

Postnasal set
Mouth gag
Tongue depressor
Postnasal plug

The postnasal set is not necessary except when ether is given.

Radical Antrum

A Radical Antrum operation requires the following instruments:

1 scalpel
1 Mayo scissors
1 rat-toothed forcep
1 tissue forcep
1 bayonet forcep
1 angular nasal forcep
1 Meyers biting forcep
1 Green forcep
1 Luc forcep
1 side forcep
1 Hooper forcep
1 nasal speculum
1 medium Killian
3 Kerrison Rongeurs (different sizes)
1 mallet
1 chisel
3 large curettes (2 Blakes, 1 Jack)
1 conchotome (Ring punch)
3 lip retractors
2 hemostats
1 probe
1 director
1 searcher
2 antrum rasps
1 gauge
1 mouth gag
1 tongue depressor
1 uvula retractor
1 tube plain catgut No. 1
2 curved cutting needles
Sterile vaseline
Postnasal pack

Metal syringe
1 Faulkner curette
Saline
Adrenalin
Iodoform gauze

Ethmoid and Sphenoid

The Ethmoid and Sphenoid set-ups require the following instruments:

1 nasal speculum
1 medium Killian
3 long needle curettes
1 double ended curette
1 long probe
1 Luc forcep
1 Green forcep
1 Meyers forcep
1 Hooper forcep
1 bayonet forcep
1 scissors
1 medium Kerrison
1 side biting forcep
1 turbinate scissors
1 turbinate snare
1 conchotome (Ring punch, small)
1 nasal probe
Mouth gag
Tongue depressor
Uvula retractor
Postnasal pack
Anterior nasal pack
Cotton balls
Mosher strips
Metal syringe

Frontal Sinus (Killian)

The following instruments and supplies are needed for a frontal sinus or Killian operation:

1 scalpel
1 Mayo scissors
1 curved scissors
2 tooth forceps

2 tissue forceps
1 bayonet forcep
1 Luc forcep
1 Hooper adenoid forcep
1 Meyers cutting forcep
1 Green forcep
1 nasal speculum
1 medium Killian
1 periosteum elevator
1 frontal sinus chisel (Killian)
3 gauges (different sizes)
4 curettes (different sizes)
1 double ended curette
1 White's rongeur
1 C. S. rongeur
2 Kerrison rongeurs
1 turbinate scissors
1 turbinate snare
1 Allport retractor
2 hand retractors
Killian eye retractor
1 uvula retractor
2 frontal rasps
2 Lothrop No. 2 rasps
10 hemostats
1 mallet (hard rubber)
2 frontal probes
1 long dressing probe
1 searcher
1 director
1 needle holder
1 mouth gag
1 tongue depressor
4 small round needles
4 cutting needles
10 strands silk worm gut
Horse hair
Plain No. 1 catgut
Sterile vaseline
Sponges
Sterile oil
Medicine dropper
Mosher strips

Cotton balls
Metal syringe
Pressure bandage

Esophagoscopy

An esophagoscopy requires the following instruments and supplies:

Mosher laryngoscopes
Jackson laryngoscopes
3 sizes esophagoscopes (short, medium, long)
1 Alligator forcep—long
1 Alligator forcep—short
1 pair biting forceps
6 sponge carriers
Breathing tube washer
Tongue depressor
Mouth gag
Jackson lights—batteries and cords
Suction
Vaseline
Square sponges
Small cotton balls
Adrenalin
Cocaine 5%
2 sterile sheets

The clothing of the patient should be turned down around the neck and chest. For children use the same layout but with smaller instruments.

Multotherm Medical Diathermy

Use—The diathermy machine is used to control hemorrhage during the removal of malignant growths of the sinuses and other structures. Papilloma of the vocal cords and leukoplakia of the mouth are frequently removed with the diathermy. It is used also in cauterizing small tumors. Cauterizing or cutting tips are used as needed.

Sheet lead is bandaged tightly around the arm and connected to the machine by a wire covered with rubber.

The patient is deeply anesthetized and then the ether equipment is covered with a wet towel while the multotherm is used.

Laryngoscopy

2 laryngoscopes, Mosher and Jackson
1 short alligator forcep
1 biting forcep
Tongue depressor
Mouth gag
Breathing tube
Vaseline
Jackson lights—batteries and cords
Cotton balls
Square sponges
2 sterile sheets

For Lynch suspensions add the Lynch outfit. Lynch suspension apparatus. Arrange on a separate table:

Laryngoscopes, all sizes
Laryngeal speculum
Laryngeal knives
Sponge holders
Probe—long
Long scissors
Laryngeal elevators

Foreign Bodies of the Esophagus, Larynx or Bronchus

The preservation of foreign bodies removed from the esophagus, bronchus, or larynx is very important for, as in cases of foreign bodies of the eye they are often required as evidence many times in cases of insurance settlements. Foreign bodies of meat or bone on removal are put in a bottle of formalin 10%. Coins, buttons, beads, tacks, etc., are placed in a sealed envelope. In each case label with the patient's name, hospital number, and with the name of the doctor and the date.

Operating in the House

Occasionally such operations as tonsillectomies, septa, and various emergency cases, such as mastoids, retropharyngeal abscesses, etc., are done in the home, where the facilities of the hospital are not available. The nurse must therefore make the most of the limited facilities of the home, using the utensils of the kitchen for sterilizing the instruments and improvising an operating table or chair.

Sterilization

Instruments

Sterilize the instruments by boiling them in the largest receptacle available—a dish pan, preserve kettle, boiler, or the like. Have as many containers with boiling water on the stove as possible. The instruments should be boiled ten minutes.

Linen

For the usual home operation the wash boiler is used to the best advantage for sterilization of linen. Suspend a folded sheet, hammock-fashion, fastening it on both handles of the boiler. In this, place the linen to be sterilized done up in packages. Cover the boiler and allow the live steam to penetrate the goods for an hour. Remove the packages from the boiler and dry in a warm oven.

For a mastoid operation sterilize about ten or twelve small linen or cotton towels and six pillow slips. For throat and nose operations about half the amount of linen is needed.

The doctor usually brings the sterile gauze.

Operating Table or Chair

An ordinary kitchen or dining room table may be used. Put in one or two extra leaves if the table is small. Spread a thick blanket over the table and over that a piece of oil-

cloth for protection. Over the oilcloth spread a sheet. This may be used in mastoid cases.

Seat local tonsil cases in a straight back chair, the feet resting on a foot stool. A piano stool or kitchen stool will serve for the doctor.

Surgical Supplies

The following supplies, used for the most part in the operating room and for surgical dressings are made by the student nurses. A reserve supply should be kept ahead for emergencies. All supplies of gauze may be kept conveniently in sterile enamel cans, the covers of which should be labeled with the letter "s" or the word "sterile." If enamel cans are not available, do up the dressings in compress before sterilizing.

Tonsil Sponges

Cut the gauze nine inches square. Fold the corners toward the center. The sponge when finished is a two-inch square.

Mosher Strips

Gauze thirteen by four inches is required. Turn in all edges toward the center, to a width of one inch and then fold on itself in about 2½ inch lengths.

Mastoid Wicks

These are single layers of gauze five by five inches. Pick up the gauze in the center with one hand and with the free hand twist it downward.

Swabs

Toothpicks or wooden applicators are used for these. Wind one end with absorbent cotton according to size re-

quired. It requires much practice to make swabs so that the cotton stays in place. Dip the end of the toothpick in water before winding the cotton.

Nasal Packs

Fingers cut from old gloves (or regular finger cots). Pack them with one or two Mosher strips according to the size desired. At the open end attach a silk string ten inches long, through the gauze and rubber.

Square Sponges

These are pieces of gauze fifteen by fifteen inches. Fold the corners toward the center; the width when finished is four inches square.

Bronchoscopy Sponges

Cheese cloth, 1½ x 1½ inches, can be used. Fold the corners toward the center and then fold in halves and again in quarters, making a one-third inch square completion. Very small cotton pledgets are used frequently in place of the cheese cloth sponges.

Knife Compresses

Old linen or cotton cut in 4 inch squares serves for these. The material must be smooth and free from seams.

Rubber Dam

Cut the rubber into 4 inch squares. Wash with green soap, boil 10 minutes and place in bichloride solution 1-1000.

Gutta Percha Tissue

Cut the tissue into 4 inch squares. Wash with green soap and soak in bichloride solution 1-1000 for 24 hours, then place in a fresh solution of bichloride of the same strength.

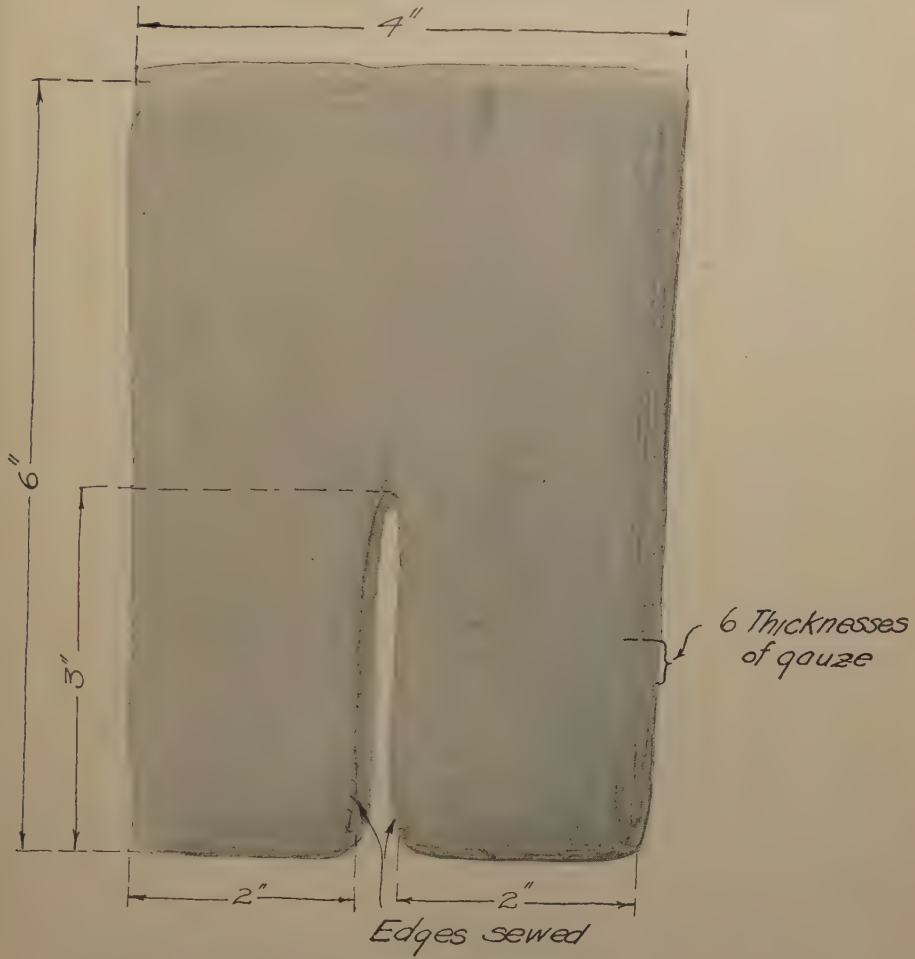

FIG. 22.—Tracheotomy Dressing (Mosher).

Tracheotomy Dressings

Cut the gauze into pieces twenty-two by fourteen inches. Fold the corners toward the center and fold again twice lengthwise. Finished, the dressing should be six by seven inches. On the six inch fold make a slit three or four inches long; compiete by turning in and sewing all raw edges.

Postnasal Plugs

Several thicknesses of gauze folded to a width of two and one-half inches serves for these. Turn in all raw edges, roll and fasten with silk thread (double) twenty-eight inches long.

Paraffin Gauze

Gauze eight by four inches is required. Turn in all the edges and fold to one and one-half inch width. Dip in paraffin, roll, and sterilize forty-five minutes in the autoclave.

Seventy-five yards of gauze cut into strips four by twelve inches and folded to one-half inch width.

Roll and pin
2 quarts 95% alcohol
10 oz. powdered Castile soap
1456 grams iodoform powder
1 quart glycerine
3 quarts saline

Dissolve the soap in saline, add glycerine and shake well. Mix the powder and alcohol in a large basin and stir constantly. Add the soap mixture and mix thoroughly with the gauze. Remove the pins and pack the rolls in Mason jars. Sterilize in autoclaves for three-quarters of an hour. Do not resterilize at any time.

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CHAPTER XXV

THE FUNCTION OF A SOCIAL SERVICE DEPARTMENT IN A SPECIALIZED HOSPITAL

A Social Service Department is today an essential part of the modern hospital, and its place there should bear as definite a relationship to the organization as any other integral part of the hospital. Its place is due to a recognition that as an aid to medical treatment it is often necessary to understand the social conditions—home, individual traits, and economic standing of the patients. Social factors such as poverty, faulty habits of hygiene, and mental instability of patients are frequently the obstacles that interfere with carrying out a successful medical treatment. In order to meet these situations and insure a continuity of both social and medical treatment of the patients, a social service department is placed in a hospital.

The medical-social worker must be equipped with special training and skilled in handling difficult psychological and social problems. She will obtain social histories from her patients, visit them in their homes, and secure that information which is important to the doctor to supplement his medical work. To the patient she will interpret the doctor's orders and plan, and with supervision see that all directions are carried out to the end. Moreover, she will teach the patient how he can participate in the plan in order to bring about his fullest responsibility for his recovery. This func-

tioning of the medical-social worker which is dependent upon the medical aspect of the case may extend over months of time, or it may be a short termed affair. It may also continue to other members of the patient's family if they show indications of medical-social problems which need attention. For instance:

A little girl was brought to the clinic with convergence of the eyes and went into the ward for an operation. The hospital social worker in visiting the child at home later found a little brother with a worse convergence than his sister's. The mother said she couldn't afford to send him to the hospital. His sister's hospital bill had been paid with money her god-mother gave her for a birthday present, but the child had been happy to spend it that way. The worker, when talking to the little boy, found he was very sensitive about his eyes, and the boys at school made fun of him. She arranged a free admission to the hospital for him, and the following week a successful operation was performed on his eyes.

There are some services apparently slight, but which will require the best in quality of judgment or persuasion that the worker has been at pains to develop. Medical-social service is concerned with those patients who need encouragement to insure their return to the hospital for treatment. Perhaps an escort must be found to bring a patient to the hospital, or carfare is needed for transportation. Then there are those patients who do not understand how important it is for them to enter the hospital, and they need explanations and persuasion. Some patients wish to go home before the doctors are ready for them to leave the hospital, and here again the worker must use her powers of persua-

sion. There are those patients whose discharge from the hospital must be followed by special care, such as carcinoma of the larynx, those who need convalescent care, or transfer to another hospital for chronic care. It may be necessary to secure financial help for a whole family or to place away from their home for some weeks a family of children. Patients who come from a long distance often with little means and over-confident of ultimate recovery to health, present complicated problems, such as permanent physical handicaps, and involve much work in getting them readjusted to their changed conditions. The hospital social worker may find it needful in order to carry a social plan to its ultimate goal, to enlist the services of one or more community resources, such as Family Welfare Agencies, legal services, Children's Protective Societies, and agencies doing specialized types of social work. This procedure of studying the patient's needs, helping him to make his plans and to carry them through, extensive or not in length of time, is termed medical-social case work. It is a process analogous to medical case work, and is the backbone or principle of the medical-social worker's task.

The following case illustrates what complications may arise in a medical-social situation:

Annie, eight years old, and Tony, three years old, both with sore eyes, were brought to the Infirmary by their mother. The diagnosis was phlyctenular keratitis in both children and the hospital social worker succeeded in persuading the mother to leave them in the hospital for treatment.

Annie belonged to an Italian family which consisted of parents, foreign-born, both forty-three years old, and ten other children ranging in ages from twenty-one years down

to seven months. They lived in an old dilapidated country house of ten rooms about thirty-five miles from Boston. The house was in the mother's name, but carried a mortgage of $2400.00, the interest of which was equal to $14.00 a month rent. There was almost no furniture in the house.

The father was a laborer earning $24.00 a week when he worked. He was called in the town a "bad man" and at this time was on probation to the Court for a charge of non-support, and ordered to give his wife $20.00 a week. The oldest boy, twenty-one years, and the sixteen year old girl added $18.00 a week to the income.

The family were known to a Children's Protective Association and the Court already mentioned.

In appearance the father was a big burly red-faced man. The mother seemed not very intelligent, perhaps because she spoke so little English. The two girls sixteen and fourteen years old were unusually bright, although slack in appearance. Outside of the father's attitude there was much affection between the members of the family, fine family loyalty and cohesion.

The diet and hygiene in the home were very poor.

The Hospital Social Worker made her first visit to the home while the two children were still in the Infirmary. She thought the conditions there unsuitable for the return of the three year old. He had had rickets and was much undernourished, so her suggestion to send him to a convalescent home was accepted by the parents. Later when Annie was discharged from the hospital to her home, the Public Health Nurse was asked to visit in the home for medical supervision. Meanwhile the seven months old boy developed a skin condition which was diagnosed at the hospital as T.B. skin

lesions, and he was sent to the T.B. ward at the State Infirmary for long time treatment. The father began to behave very badly and was giving the mother only $15.00 a week. The taxes on the house were unpaid, and any day it might be sold by the Town. The twelve year old boy was complaining of feeling weak, and the mother was sick too. The three year old boy was again at home, physically much better after six months at the convalescent home. Then the mother packed up a few household goods and with her children came to Boston where she had friends and could be near the hospital. The father and twenty-one year old boy were left in the old house.

The sixteen and fourteen year old girls immediately found work. The mother brought the twelve year old to the General Hospital. After an examination the doctor immediately recommended sanatorium care for Hilum Tuberculosis. His application was filed, and when the notice of his assignment came, the hospital social worker gathered together the necessary outfit, for the boy had almost no clothing, and he was taken to the sanatorium. Then the mother came to the hospital one day coughing badly. She said her husband had now followed her to Boston. In a previous examination at the hospital her condition had been found negative for T.B., but now when examined she had positive signs and the doctor said she must go to a sanatorium. She consented if her children could be cared for. The two girls and the hospital social worker discussed what possible plan could be made. The mother would not go away and leave the children with the father,—if the six small children could be placed in foster homes she would go willingly. The two girls would not remain alone with their father as he had threatened to

abuse them. It was finally agreed that the girls could support themselves and board with their mother's friend. An application was made to a child placing society to take the six children. The father was indifferent to this plan but made no objection. At the end of nine months the worker faced this problem of family adjustment.

Upon application to a children's agency, the question of board for the children was raised, as there was no certainty that the father would contribute anything. Whereupon a children's protective society was approached to bring pressure on the father for support of his children. Discussion arose between the latter agency and the child placing society as to whether the financial support of these children belonged to the Overseers of the Poor of their own town. But the Overseers refused to accept the responsibility. They were paying the board for two children, the seven months old in the State Infirmary and the twelve year old in a State Sanatorium, and they would pay for the mother's board at a sanatorium. Then the mother offered to give up her house to meet the expense of the children's board, and the town officials agreed to take up this matter with the Children's Societies. Meanwhile during a delay of a month the mother grew ill and the three year old became ill, so that the district doctor and nurse had to be called.

The fourteen year old girl gave up her work to remain at home and care for the family. The hospital worker and the chief of the Children's Society in conference agreed that the mother and children should suffer no longer from the father's neglect. So five children were examined at the hospital for health certificates. Before they could be placed, the ten year old was taken sick, diagnosed "Scarlet Fever and

Septic Sore Throat" and sent to a hospital for contagious diseases and the family went into quarantine. As the children and the mother were not having sufficient food, the hospital worker arranged to send extra milk, eggs, and oranges to the home unknown to the father. The father was forced to pay the grocery bill so the family's credit could be extended. Then the mother suddenly grew discouraged, gave up hope of getting away and decided she would take the children and leave the father. The hospital worker had to counteract this depression, and as soon as the quarantine was lifted, the children were examined a second time for their health certificates.

In about two months time after the mother's application was filed for a sanatorium, she was admitted there for care. Five children were placed by the Children's Society. The father agreed to pay $10 a week board for the five children.

In due time the ten year old came out of the contagious hospital and was placed with the other children. And now after another month the sixteen and fourteen year old girls grew very tired of city life and wanted to return to the country to their old home, to be near their mother so they could visit her frequently. The sixteen year old took the bit of furniture out of storage and home they went to live with the twenty-one year old brother. The father remained in the city.

Although the girls again secured work, their pay was small, the taxes on the house were hard to meet, and the sixteen year old had to carry the greater part of the responsibility. She kept in touch with the brothers, sister, and mother. The hospital worker could not visit her at this distance as often as she thought necesary, so she looked in the town for

a friendly visitor. Fortunately she found a woman of good sense and some position, of their own religion. She was willing to act as a friend to the girls and help them in some of their perplexities. The mother was happy at the sanatorium and was gaining in strength.

The town officials arranged the transfer of the twelve year old at the State Sanatorium and the seven months old at the State Infirmary to the Country Sanatorium where the mother was. The father did not keep up his payments for the children and he returned to the home town. He continued to have nothing to do with his family. The twelve year old was discharged to his sister's care.

In one year from the time the mother entered the Sanatorium she died. She left no will, but the lawyer who handled the sale of the house was interested in the children and managed as well as he could for their interest. There was quarelling with the father regarding the mother's insurance on which the sixteen year old had kept up the payments.

Five months after the mother's death, the father married a young woman twenty-five years old, and he took the three younger boys home with him. (The seven year, three year and eleven months children each now three years older.) The sixteen year old worried about this, but the brothers told her their step-mother was good to them.

Three years after the opening of this story, and one year after the mother's death, the sixteen year old and fourteen year old, (now nineteen and seventeen years) girls were on their feet, boarding in a good home, at work and getting on well. They were much liked; the sixteen year old had an excellent reputation for her care of the family. The original patient, Annie, was well established in the home of friends

who had no children of their own. The twelve year old (now fifteen) boy was working for his board and room in another family. The seven months old boy (now three years old) was still in the Country Sanatorium but in good health. Two children were still in the care of the Child Placing Society, although the father threatened to take them. Through the nineteen year old girl's influence, the Society promised to refuse his request without the probation officer's consent. As the father owed back board this could be done.

Although considerable detail of history and work done in this case has necessarily been omitted, the main facts show that the hospital social worker was the person who held the continuity of responsibility during those three years. She believed in the fine quality of the children, and from the beginning felt there was good family material for constructive work. At her first interview with the mother and as each new problem arose, the hospital social worker met the family wishes with open-mindedness. Their cooperation with her plans was sincere, so there was never any difficulty in their mutual relationships. The delays were occasioned largely because complication after complication arose and also because so many agencies were necessary to accomplish the social and health adjustment.

Twelve different organizations in all were active at different times in this family during the three years.

Medical-social service in its existence of less than twenty-five years, has not lived long enough to have determined what all of its functions may be. Nevertheless, more success seems to follow where it shows considerable adaptation to the special type hospital of which it becomes a part. Medical-

social service in a small, specialized hospital does not differ in principle or quality from that practiced in a large general hospital. Some methods of work might develop in the former which in the main would show a different emphasis from the larger part of the work in the letter. This is true of the specialized hospital, the Massachusetts Eye and Ear Infirmary. Here the protection of the eye-sight and prevention of deafness enter largely into the medical work of the institution, so that the medical-social service picks up this thread and follows in the same direction. This promotes the development of a system built upon the case work principle where groups of individuals with the same diagnosis are followed intensively. Sight and hearing are precious things, and often where no purely social problem exists, it is necessary to instruct the patient to convince him that medical treatment is urgent if vision and hearing are to be conserved. Certain eye diseases, if uncared for, are more destructive to sight than others. Especially true is this of some conditions to which children's eyes are more susceptible. These, if neglected, will handicap their vision for life. Again with little children, if treatment is neglected, in acute or chronic running ears, it may cause development of deafness in later life, which will handicap them.

The first in importance of eye diseases which enlists the services of a medical-social worker is the serious condition of babies' eyes known as Ophthalmia Neonatorum. Here her procedure of work is very clear cut. She secures an accurate history of any neglect of the baby's eyes before coming to the hospital, to supplement the doctor's history. Whenever possible she urges the baby's mother to come to the hospital to give her baby breast feedings. If she is not strong

enough for this travelling to and fro, or if she lives at too great a distance from the hospital, she is instructed in the process of obtaining her milk and sending it to the hospital by messenger or parcel post. The parents of the baby with a Gonococcus infection are persuaded to be examined and undergo the treatment that is necessary. Not only is the baby followed for its eyes after leaving the hospital, but the mother is referred to a baby welfare station for the hygienic supervision and feeding of her baby. If a baby is discharged from the hospital with damaged eyes, it is reported to the Massachusetts Division of the Blind for following until the child is of school age. When this time arrives, entrance to a school for the education of the blind is secured, and his training for a place in the industrial world begins. Owing to the law in Massachusetts which pertains to reporting to the Board of Health babies with sore eyes, the number of blind babies has been greatly reduced within the last fifteen years.

The hospital social worker, from long experience with social problems in mother and baby work, was able to bring about the following result in an apparently obstinate case.

A nine-day old illegitimate baby with gonorrhoeal ophthalmia was referred to the Infirmary by a physician from the neighboring town. The mother was a twenty-eight year old daughter in a very respectable Italian family of mill workers, who were long time residents of the locality where they lived. The girl's brother brought the baby to the Infirmary, and said the family had scraped together $350.00 which they were to pay to the institution where they had decided that the baby would go to be given out for adoption. When asked what the baby's mother's attitude was to this plan,

he replied she had "nothing" to say in the matter. The father of the baby was "no good", the family would never consent to a marriage, and they wanted "nothing of him".

By the time the baby was ready for discharge from the hospital, the medical-social worker had succeeded in changing the family's point of view. A child placing society agreed to take the baby temporarily for boarding in a foster home. As soon as the baby's mother was able to travel she came to Boston to talk with the chief worker of the society. The mother showed a willingness to assume responsibility of her baby, and her family promised to assist her in paying its board. This plan continued with the idea in the worker's mind that eventually the mother and child would be brought together.

The second group in which every child is followed is the Interstitial Keratitis cases. These patients are linked up with the Syphilis Clinic in the General Hospital for systemic treatment. The medical-social worker in the eye clinic keeps the patient under active treatment in both clinics until the eyes have become white and quiet. After some months have elapsed with no recurrence, the responsibility of the "following" shifts to the worker in the Syphilis Clinic, as the patient may require a long time treatment there. The eye worker must see that brothers, sisters, and parents of the patient come for examinations in the special medical clinic. Her tact and wisdom are brought into play here, as many delicate situations arise in this family work. The case work may differ in each patient's family, but some problem of education always exists for the child with Interstitial Keratitis. A worker following her patients with persistency, so that they continue under medical care for a long period, is sure to

see very hopeful results in the majority of cases. But if the eyes of a patient are very much damaged following severe attacks, this may necessitate his entrance into an institution for training of the blind.

The third group important to follow is that of the Phlyctenular Keratitis patients. Here the cooperation of a Children's Clinic in the General Hospital is essential for the complete physical examination and special tests. These children often show pre-tubercular indications. Careful investigations are made in their homes, searching for any signs suggestive of tuberculosis in the family history. The worker's task of teaching good hygiene and diet to the mothers of the children is most important. When good habits of living are established with these children, the recurrent attacks so prevalent a few years ago are many times prevented.

These groups illustrate how some of the medical-social work is handled at the Massachusetts Eye and Ear Infirmary, but they do not constitute its entirety. Glaucoma and Trachoma patients come in for their share of following in groups and long time case work. A medical-social worker in the wards of the hospital finds many problems requiring the transfer of patients to other hospitals, often chronic hospitals or convalescent homes. She draws largely upon the community resources for assistance with her ear, nose, throat, and eye patients. Children with a diagnosis of high myopia, those with a loss of a certain percentage of normal vision in each eye, and those who are hard of hearing, are problems for the schools. With the persons in charge of the sight saving classes and lip-reading classes in the public schools, we have established a systematic reporting of these children, after which they are placed for special methods of education.

Children with a minumum vision, practically blind, are reported to the Massachusetts Division for the Blind, who arrange their admission to Perkins Institute for the Blind. Our deaf mute children, or those who have become totally deaf, are reported by social service to the Massachusetts Board of Education, and by them are assigned to the different schools for the deaf. Adult patients who have lost their vision are steered for industrial training in some work-shop of the Division for the Blind, if they show aptitude for this rehabilitation. The adult deaf and hard of hearing in the majority of cases are referred for instruction in lip-reading to the Speech Readers Guild of Boston.

Although a medical-social service department is not equipped with funds for relief it has been found necessary to meet some conditions with financial assistance. In refraction cases when, after investigation, it is found that a patient cannot pay for his glasses, a loan or a gift may be arranged for him. A patient comes from afar with just enough money to reach the hospital. Upon discharge, before relatives or friends can come to his assistance, transportation costs and some necessary expenses for his homeward journey must be met.

In determining to what extent work can be attempted and what seems the most important tasks to be taken up first, the size of the medical-social service department must be considered. The program for the department should be made jointly by the medical staff and the chief of medical-social service. If a department of reasonable size can be maintained so that work for special diagnosis groups can be carried over a period of years, the department can contribute to medical and social research. Studies from both

these angles must grow out of such a method of work if well done. For instance, in the early days of the medical-social service department at the Massachusetts Eye and Ear Infirmary, an extensive study was made on the cases of Ophthalmia Neonatorum. It was this study which was widely circulated and which showed in its findings startling results that helped to shape some of the legislative measures concerning this disease.

We have shown that the social worker plays the part of interpreter between the doctor and patient. We shall find it is as necessary for her to take up the role of interpreter between the hospital and those community resources most concerned with the various health activities—boards of health, public health nurses, school nurses and private nursing associations. The closest kind of cooperation should be established between the public health movement and the medical-social service. In the hospital for the acutely ill, where beds are constantly in demand, patients may be discharged home earlier if visiting nurses can be called upon for continued treatments and daily dressings in the home. Home treatment following an acute or chronic ear in a child who cannot be brought back daily to the hospital may prevent the development of a mastoid, also the nurses' services will prevent waste of medical work already done. Visiting nurses teach the mothers how to give ear irrigations, and then with following the cases report progress to the medical-social worker, she in turn communicating with the doctor in charge. This home nursing and education correlated by the medical-social worker with the medical work done in the hospital results in perfect cooperation in service to the patients. The medical-social worker who knows the com-

munity from which her patients come is called upon constantly to interpret to public health officials the scope and possibilities of medical service in her hospital. In view of the increasing activities of public health work, modern hospitals presumably will take on new relationships towards some of these measures. So the hospital social worker should have increasing opportunities for this function of interpretation.

The first duty of the hospital social worker is service to the patient. This service is not only directly related to his medical treatment, but must bring to bear upon his individual problems any or all of those community resources that will best contribute to his recovery to health and normal living.

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